agriculture

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MONTHLY

Royal Showground, Kenilworth page 95

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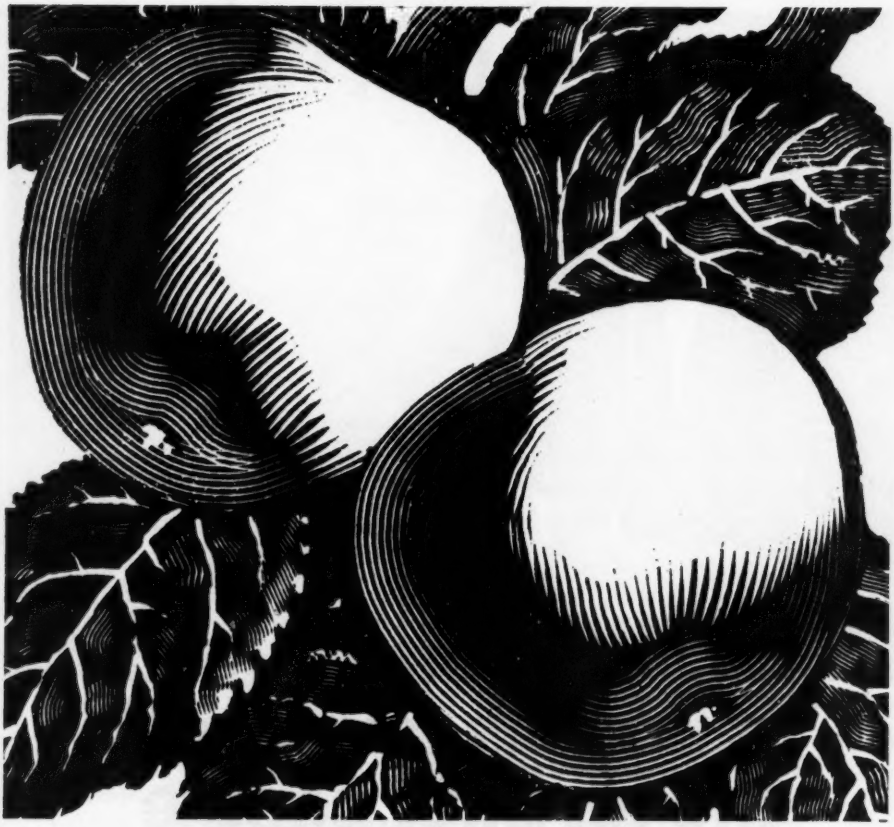

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Contents

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A.D.A.S. — Its Advisory Work

ON 1st March 1971 the Ministry's professional, scientific and technical services were brought together in a unified Agricultural Development and Advisory Service (A.D.A.S.). An important part of its functions are advisory. This note briefly outlines the broad policy on which it is proposed to base this advisory work in future, and discusses the implications of the policy in terms of the advisory aims and objectives of the new Service.

The Government's policies for agriculture, its determination to reduce Government intervention and public expenditure, to use resources economically and to encourage greater self-reliance in industry and the individual, the increased availability of advice from sources outside the Department, the industry's development and its future essential needs—all these have pointed to new and more selective objectives for the Department's agricultural advisory work. Working to these objectives will significantly reduce the total advisory effort but will do so in a way that will continue to promote the growth of productivity in the industry.

Thus A.D.A.S. will provide a more economic yet more effective advisory service: it will concentrate advisory work where it is likely to be justified by the resulting additional productivity of the farm, or to contribute to agricultural productivity generally. General advisers will deal with the generality of problems and systems of farming in their districts; they will need to be supported only by small regionally based groups of husbandry, management and science specialists. A.D.A.S. will not give advice or services of kinds which are available from sources outside the Department or would become available if the Department ceased to provide them; thus it will progressively withdraw from such spheres of work as detailed farm management advice, advice on estate management, and designing of drainage schemes. Individual visits to farms will be reduced and more emphasis placed on group advice. Farmers will be expected to seek out the adviser and come to him rather than the reverse. Charges will be made for a wide range of services, such as the testing of soil samples, designs for drainage schemes and certain diagnostic work, but not for advice.

Detailed studies, region by region, will be necessary to quantify the reduction in work and hence in staff requirements that will follow the adoption of the new objectives. This will take time, and the changes themselves can only evolve over a period during which the necessary new attitudes and approaches to advisory work will develop among advisers and farmers. In a later issue, Mr. W. E. Jones, the Director General of A.D.A.S., will describe the way in which the unified service is settling down to its task.

There are two aspects of the Ministry's advisory service which will not change. The advice given by A.D.A.S. officers will continue to be impartial and in the best interests of the farmer and grower; and the Service will seek to maintain the high tradition previously set by the separate services which it now combines.

COVENT GARDEN MARKET AUTHORITY ANNUAL REPORT

The Ninth Annual Report of the Covent Garden Market Authority has been published. It records the activities of the Authority during its ninth accounting period from 1st October, 1969 to 30th September, 1970.

The Authority, acting under the powers conferred on it by the Covent Garden Market Act, 1961 and a subsequent Act of 1966, has the responsibilities of managing the existing market and in due course of transferring it to a new site at Nine Elms, Vauxhall. Construction of the new market is due to commence early this year and is expected to be completed in 1973.

Copies of the Ninth Annual Report are obtainable from the Covent Garden Market Authority, Bedford Chambers, Covent Garden, London, WC 2E 8HA, price 50p plus postage.

Agricultural and Horticultural Improvement Grants
Revised Standard Costs

Revised schedules of standard costs have been introduced. The revised rates will apply to work carried out on a standard costs basis for which approval or written authority to start work was given on or after 15th February 1971, under the Ministry's Farm Capital Grant Scheme, the Horticulture Improvement Scheme, and certain other capital grant schemes.

The rates have been increased and a few minor modifications have also been made to the specifications. No new items are included in the general schedule, and only one—subsoiling—in the schedule of field drainage works. The item for a soil cement road has been withdrawn because there has been little use of standard costs for this work.

The new rates are expressed in decimal currency. The measurements for many items are given in metric terms: this is because the construction industry and some others with which farmers will be dealing will be quoting metric measurements for their products. The grant in such cases will be based on the metric measure. For general guidance the imperial equivalents are quoted alongside.

Explanatory leaflets can be obtained from the Ministry's divisional offices.

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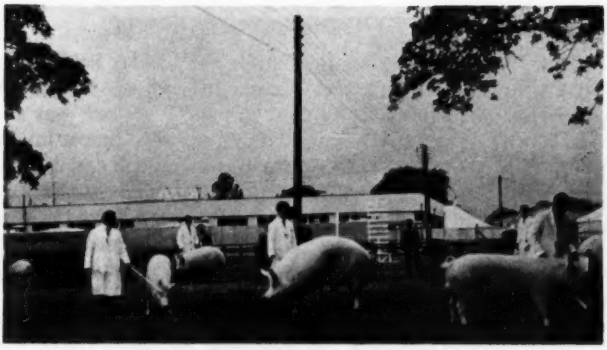
Food Hygiene on the Farm

The Food Hygiene (General) Regulations 1970 came into force on 1st March, 1971.

The Ministry of Agriculture, Fisheries and Food has prepared an explanatory leaflet for the guidance of those farmers who will be affected by the Regulations, mainly those engaged in the business of packing or storing eggs, fruit or vegetables.

Copies of the leaflet can be obtained from any of the Ministry's Divisional Offices in England and Wales.



Judging show pigs at the Royal Show

The Royal Agricultural Society of England was founded 130 years ago. This article briefly describes its achievements and aims for the future. The Society is justly proud of its motto

Practice with Science

P. R. Taylor

THE Royal Agricultural Society of England is known to most people as the organizer of the Royal Show, and indeed it has undertaken this duty since its formation in 1838. However, its influence has not been limited to this sphere alone and has had many lasting repercussions on British agriculture as we know it today. 'The English Agricultural Society', as it was first known, gained its Royal Charter under its present title in 1840 through the efforts of the third Earl Spencer. Such was its success that by 1844 it had a membership of almost 7,000.

At about this time the country faced a major crisis caused by the population explosion of the industrial revolution. Farmers could not meet the food requirements of this new work-force and for the first time Britain became a food importing nation. The Royal Agricultural Society of England was not idle during this period. Many of its members, inspired by the advances made in implement design and food production, laid the firm foundation that made possible the intensive production demanded by two World Wars and still necessary today.

The Royal

In 1839, only one year after its foundation, the Society held its first show at Oxford 'in Mr. Pinfold's Pasture Ground, Holywell'. It was similar to earlier sheep-shearing and agriculture gatherings. Livestock was shown, of course, and improved and newly invented implements, almost invariably of home design made by the local blacksmiths, were exhibited and demonstrated. Alongside this 'Country Show' a conference and implement trials were also held and it became the forerunner of the Royal Show as we know it today. The 'Royal', as it is now known to agriculturists at home and abroad, has been held annually, except during the two World Wars, with great popularity in almost every area in England.

During its 132 years experience the Royal has developed to become one of the largest shows of its kind in Europe. Many innovations have been introduced and new classes and awards added, not only for livestock but also in recognition of individual services to the agricultural industry.

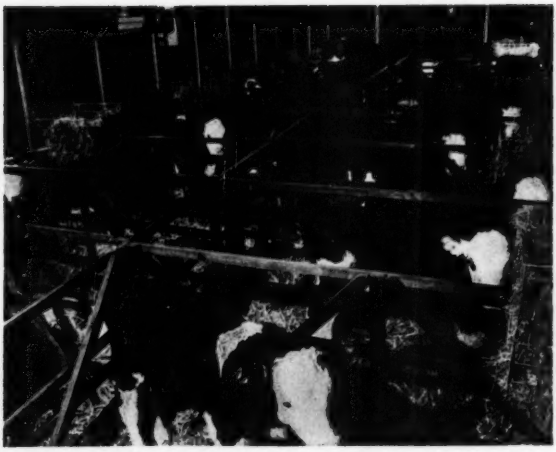
Education

The Society has also been a leader in the field of agricultural education. In 1896, together with the Royal Highland and Agricultural Society of Scotland, it sponsored the National Diploma in Dairying (N.D.D.) and four years later the National Diploma in Agriculture (N.D.A.). There are two pre-requisites for diploma students: a sound general education, including science subjects, and preliminary practical experience. Both diplomas are open to students from overseas. The total number of awards made in both categories is now nearing 10,000.

National Agricultural Centre

In 1962 the Society took a major decision to move its permanent home to Stoneleigh Abbey, near Kenilworth, Warwickshire. In 1963 the first permanent Royal Show was held at Stoneleigh, and a long cherished ambition to become the shop-window of British agriculture was achieved. In doing so, however, the Society became faced with the problem of having over 600 acres of land in the heart of England, and at the centre of the country's communication links, lying idle for the best part of each year. Out of this situation, as a natural extension of the Society's original charter to serve the industry, arose the conception of the National Agricultural Centre as a focal point of British agriculture. The Centre was opened in 1967. Development has been rapid, and now, three years later, there are eight fully established demonstration units which cater for calf-rearing, pigs, beef, sheep, dairy and poultry farming. There are also units specializing in farm buildings and electro-agricultural engineering. In March 1971 the Town and Country Centre will be opened as a permanent unit, to forge a link between rural and urban life and continue the role in education.

Several important agricultural organizations now have their headquarters on the site. These include the National Federation of Young Farmers' Clubs, the Agricultural, Horticultural and Forestry Industry Training Board, and the British Horse Society; the last has recently built the National Equestrian Centre, one of the finest indoor arenas in Europe. In December 1970 the Aberdeen Angus Breed Society also opened an English base at Stoneleigh.



Interior of calf house, with controlled environment. A popular unit at the National Agricultural Centre

Creation of Advisory Board

The Society recognized that on its own it could not hope to develop its brainchild fully, and in December 1965 fifty-seven organizations connected with the industry met together under the Chairmanship of Lord Netherthorpe, a Trustee of the Society. As a result the National Agricultural Centre Advisory Board was set up so that the widest possible counsel could be obtained. Senior agriculturists from most spheres of the industry serve voluntarily on the Board, and great importance is placed by the Society on their views when it considers any development programme.

Whilst proud of its high standards, the Royal Agricultural Society is not by nature self-satisfied and still looks for improvements. It plans to encourage an ever wider range of equipment and livestock entries at the Royal Show. To this end, in March 1968, the Livestock Improvement Committee, under the Chairmanship of Lord Crathorne, was set up by the Council of the Royal Agricultural Society of England. The Committee's report (The Crathorne Report) was published in October 1970. Its far reaching recommendations will, however, be discussed in detail with breed societies and all other interested organizations before any changes are made.

International interest

The Show is fast developing an international flavour, and a record number of overseas visitors attended the 1970 Show. It has been noticeable for some time that since Britain's entry into the Common Market became a possibility, the number of visitors from the countries of the European Economic Community has grown from year to year. International interest is now higher than ever, and the Society is actively seeking the establishment of national pavilions at the Show. Results so far are encouraging, and full international recognition of the status of the Show cannot be far away.

Many visitors from home and abroad spend at least two days at Stoneleigh to make sure they do not miss anything of importance. Sophisticated information units are being planned to make sure that visitors' time is well

spent. The first, the Machinery Advisory Panel, was opened for the 1970 Show and was widely praised by farmers and exhibitors alike. Much valuable time was saved by directing farmers to the manufacturer who could cope with their specific problems.

The Society has played an important and active part in European Conservation Year and has sponsored a National Delegate Conference on 'Agriculture and the Countryside'. Its report was presented to the Duke of Edinburgh's Conference held at the Guildhall in London in October 1970.

The Farm Buildings Centre at Stoneleigh Abbey

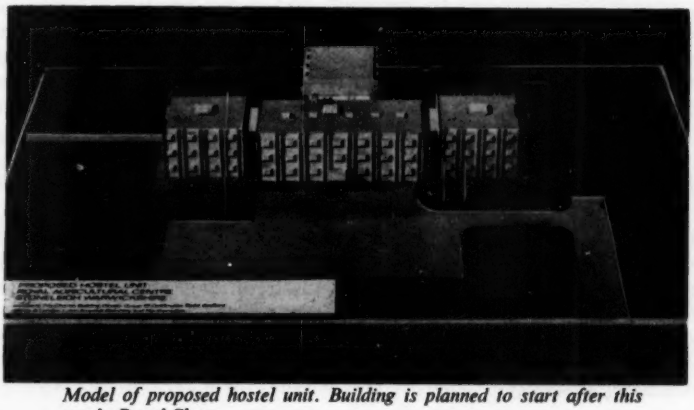
Financing expansion plans

It is doubtful whether any agricultural society is more buoyant in its financial position and in its rapidly expanding membership, which is currently rising at the rate of 2,000 per annum because of an active recruiting campaign. In order to cope with this upsurge of interest, the Society is now reviewing the facilities provided for its members. Plans are being considered for the erection of a new conference centre seating some 350 delegates; this will also be used as a Members' Pavilion during future shows. Building will commence immediately after the 1971 Show. A hostel is also being planned to service this centre and provide additional accommodation for other events.

Any organization with expansion plans as large as those of the Royal Agricultural Society faces a common problem—finance. In January 1970 the National Agricultural Centre Development Fund was launched, with a target of £1,500,000 and by December of that year approximately £850,000 had been raised. It is intended that the technical demonstration facilities and the staff required should be expanded considerably; this work will need considerable development capital. Major expansion of all essential services is necessary;

improved communication services are in the process of being set up to develop the link between the National Agricultural Centre and the 31,000 visitors who have already passed through it, and to continue the work of encouraging visitors both during the Royal Show and throughout the year.

The Society, through the National Agricultural Centre, already provides an important facility for exports; consequently a proportion of the Development Fund is earmarked for developing its export and sales potential. The Royal Show and the National Agricultural Centre provide one of the most important agricultural export opportunities available for the British Industry. When the Fund completes its work, it will have represented a dramatic breakthrough in the work of the Centre.



Model of proposed hostel unit. Building is planned to start after this year's Royal Show

Challenge of the future

The Royal Agricultural Society's motto 'Practice with Science' is still as relevant today as it was when it was coined one hundred and thirty years ago. The National Agricultural Centre continues this theme, and its future will remain a constant challenge to the Society. A new slogan might now be introduced—'Boldness with Reality'—a theme which has enabled the Society to create a new dimension in British agriculture. Stoneleigh is the latest chapter in a history of successful service to farming which has spanned its long existence. Much has been accomplished, but much remains to be done. Agriculture is still Britain's largest industry. In this dynamic and changing world the work of the Royal Agricultural Society of England will go on.

The author, **P. R. Taylor,** is Head of Public Relations of the Royal Agricultural Society of England at Kenilworth, Warwickshire.

In this article the author discusses why we should all reconcile our differences in order to accept the challenge created by

Change in the Countryside

J. R. Rundle

It is, I think, fairly obvious that, whether we like it or not, we live in a changing world. Change is taking place all the time in scientific development, in technology and industry, in transport, and in our social conditions and attitude to life generally. Man-made changes contribute to this natural and continuing process but not all those made by man are good; men make mistakes and these have to be put right. Perhaps as a result many of us tend to fear and resist change and the older and more set in our ways we are, the more we fear and resist it. We must keep in mind the tendency of human beings to resist change merely because it is change.

Changes taking place in the countryside are both visible and invisible. The visible signs are the new buildings, the motorways, reservoirs, areas of afforestation and so on. The invisible changes are those which affect the traditional rights of property and the results of public attitudes towards land ownership and occupation and many of the traditional country sports and pastimes. These invisible changes spring from the increasing demands of a growing population and many are reflected in the Countryside Act of 1968*.

Conflicting interests

Different sections of the community have varying interests in the countryside. Those who work in the country and whose livelihood depends on using the land for agriculture or for forestry want to continue their time honoured freedom to build the houses and farm buildings needed for their enterprises without hindrance; more especially, to do so without having to conform to standards which may add to their cost. On the other hand, there are the preservationists who want the pattern of the countryside to remain unchanged; and the public who seek increasing freedom to wander at will in the countryside but do not always appreciate the factors which can cause financial loss to the farmer. Somehow or other all these interests have to be reconciled, for we are a growing population and have to live together in a small island.

The various groups and interests have to learn to accept certain principles. The preservationists must understand that the countryside, as we know it today, is not entirely natural but largely man-made. Most of our landscape owes its appearance to the hand of man, chiefly man as a farmer, although man as a forester has influenced it too. This is true whether we are thinking of the intensively cultivated arable areas or the milk producing grasslands, or even the high moors where herbage is largely controlled by grazing sheep.

The natural climax vegetation of most of this country, with the possible exception of the tops of the highest hills, is forest: probably a rather scrubby sort of forest with ash as the dominant tree on the limestone soils and oak,

*A summary of the provisions of the Countryside Act 1968 was printed in *Agriculture*, May 1969.

birch and alder elsewhere. It is to this state that our countryside would ultimately revert but for the efforts of the farmer.

Role of farmers

The farmer can and will maintain the landscape only if it pays him to do so. He does it not out of a desire to preserve its appearance for the benefit of the public at large but because it is one of the assets of his business. Like any other business, this situation can continue only as long as it is reasonably economic. If the farmer is financially hard-pressed the maintenance of his land and buildings will suffer and the landscape will deteriorate.

One factor which has a marked effect on the profitability of a farm enterprise is the capital cost of its buildings. The pace of change in farming techniques is such that it is often necessary to write off the cost of farm buildings over a relatively short period; not because they are worn out but because they become obsolete. This makes it necessary to keep capital costs to a minimum, which leaves little scope for meeting the demands of amenity interests if any substantial increase in capital costs is involved. On the other hand, farmers must recognize that they have a duty not to perpetrate eyesores in the rural scene as some have done in the past and are doing, even now.

What is an eyesore?

There is no hard and fast answer to this question. There is a rather overworked phrase 'beauty is in the eye of the beholder'; overworked it may be but no other is so apt. Opinion as to what is or is not beautiful, what is or is not fitting in the countryside varies with individual taste. There are few objective standards; it is easy to recognize extremes of ugliness or beauty but there is room for a great range of opinion between those extremes. In this context it is important to remember that change is inevitable; we must not fear or oppose it merely because it is change.

It is possible, however, to recognize the bad examples which shock and offend most people, like the farmer in the south of England who erected a 60 ft tower silo close against the tower of an ancient Saxon church! Some of the worst cases are those where sheer untidiness of construction or dilapidation of the materials used causes offence to the eye. I recall two farmsteads in a demonstration intended to show how low-cost cow accommodation could be constructed by the farmer himself. In one of these, the gable end of a building was covered with a sort of patchwork quilt of various cladding materials—timber and felt, asbestos sheets, rusty galvanized iron, etc. The effect was of a rural slum, yet it would have been possible, at little more cost, to have produced a much more acceptable effect. In the other, the materials (creosoted timber and felt), being all dark in tone, were perfectly acceptable but the raggedness of construction of the sleeper walls of a silo and the presence of a large number of coloured plastic fertilizer bags gave the whole thing an air of untidiness which offended the eye. Here again, some attention to detail and a trifling cost could have made all the difference.

Reconciling points of view

I must make it clear that I am not against the development of low-cost farm buildings; I am all for the farmer who is willing to try to help himself by doing his own building work. But unless he gives some thought to the

final appearance he may only be putting more ammunition into the hands of those who seek to bring all farm buildings under planning control.

Reconciliation between the farmer and the planner, between the agricultural interests and the amenity interests is a matter of willingness on both sides to consider the point of view of the other. It can be brought about by consultation and by conference and it needs to be brought about soon. Entrenched attitudes, whether they be the farmer 'standing on his rights' or the preservationist insisting that anything new should not be seen will not help. Reconciliation will be much assisted by the recent work of the Council of Industrial Design which has produced some useful guide-lines of materials and colour schemes suitable for use in farm buildings.*

Recreational needs

We need to reconcile also the farming and land-owning interests with the increasing public demand for recreation. Recreation covers a very wide field, from the man who is content to sit in his car in the country asleep in the sun with a newspaper over his face, to the hardy souls who walk the Pennine Way or scramble up crumbling rock faces or burrow through dark caves and potholes. Whether we like it or not, the tide of popular opinion is towards giving the public more rights of access to our countryside so that they can break from the monotony of work and the stresses of life in crowded cities. This is a tide which we cannot turn or withstand: it is something which those who live and work on the land will have to learn to live with. If the public is to have greater freedom, however, it must, in its turn, learn to respect the countryside and the needs of the farmer. Any amenity body or authority which has conservation at heart must hammer this home to those who wish to enjoy the pleasures the countryside can give.

Preserving wildlife

Modern farming methods, particularly in arable areas, can conflict with the interests of those who seek to preserve our rapidly vanishing wildlife. This is a sad situation, for no countryman can view with equanimity the prospect of fewer butterflies, birds and wild flowers. In my lifetime all these have greatly diminished and most of this can be laid at the door of agricultural progress; not merely because of chemical weed-killers and insecticides but also as a result of increased and intensive cultivation and the loss of small areas of uncultivated land where wildlife thrives. Drainage, too, has played a big part in reducing areas of special interest to the naturalist.

Here I am in a genuine personal dilemma. While I recognize and am convinced of the economic need to maintain and even increase our agricultural production, as a countryman and as, in an amateur sort of way, a naturalist, I deplore the depletion of our natural flora and fauna. There is increasing public interest and support for the various societies, trusts and other bodies dedicated to preserving our wildlife and they are doing an increasingly good job. There is, in this field too, a need for more co-operation between farmers and naturalists. With goodwill, and a bit of give and take on both sides, there should be room in the countryside for both.

J. R. Rundle, B.A., F.R.I.C.S., the author of this article, is with A.D.A.S. at Leeds.

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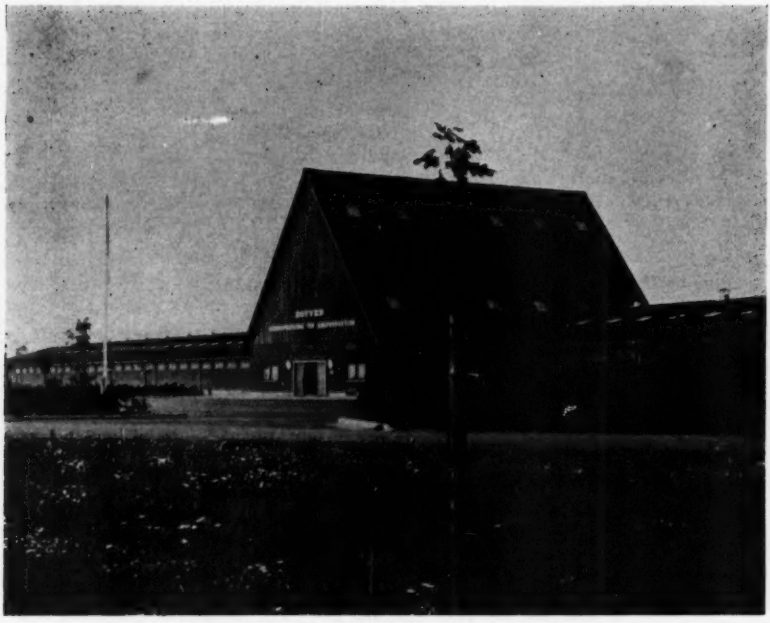
*Colour and farm buildings was discussed in an article written by Professor A. C. Hardy in *Agriculture*, November 1970.



Egtved Danish Meat and Progeny Testing Station

The Danish Cattle Breeding Programme

G. K. Mathewson

DANISH Society is in a state of change from agriculture towards industrialization. On the arable east coast around Copenhagen, farm labour is scarce owing to competition from industry. Twenty farmers per day are leaving the land and to remain economic the average dairy herd size is increasing from the present twelve cows.

Milk and cattle production are concentrated mainly in the wetter western part of the country, i.e., Jutland. The national total number of cows has been declining since 1960 and in 1968 there were a little over 1½ million, the main breeds being Red Dane (40 per cent), Black Pied (Friesian) (43 per cent) and Jersey (15 per cent). There is no significant number of beef cattle although Charolais bulls are being used increasingly for crossing with Jerseys. Artificial insemination is used extensively and there are no less than sixty-three inde-

pendent A.I. societies; although they are all members of a federal association, such diversity is an obvious obstacle to the development of a national plan.

The Danish plan

The blueprint for the Danish programme, which is closely related to and influenced by other Scandinavian schemes, is shown opposite. It is a programme, not an established system; different parts have reached varying stages of development and because it is hard for men to face facts that undermine long-held strong beliefs, the full implementation of this plan will probably take a considerable time.

Bull mothers will be selected on their production performance with particular importance attached to intra herd contemporary comparison, conformation and milking rate. At present there is very little pre-mating selection for potential A.I. bulls and most young bulls purchased for the A.I. studs are from matings planned by farmers as opposed to A.I. societies. Some are bought whose sires have no contemporary comparison rating.

Performance testing

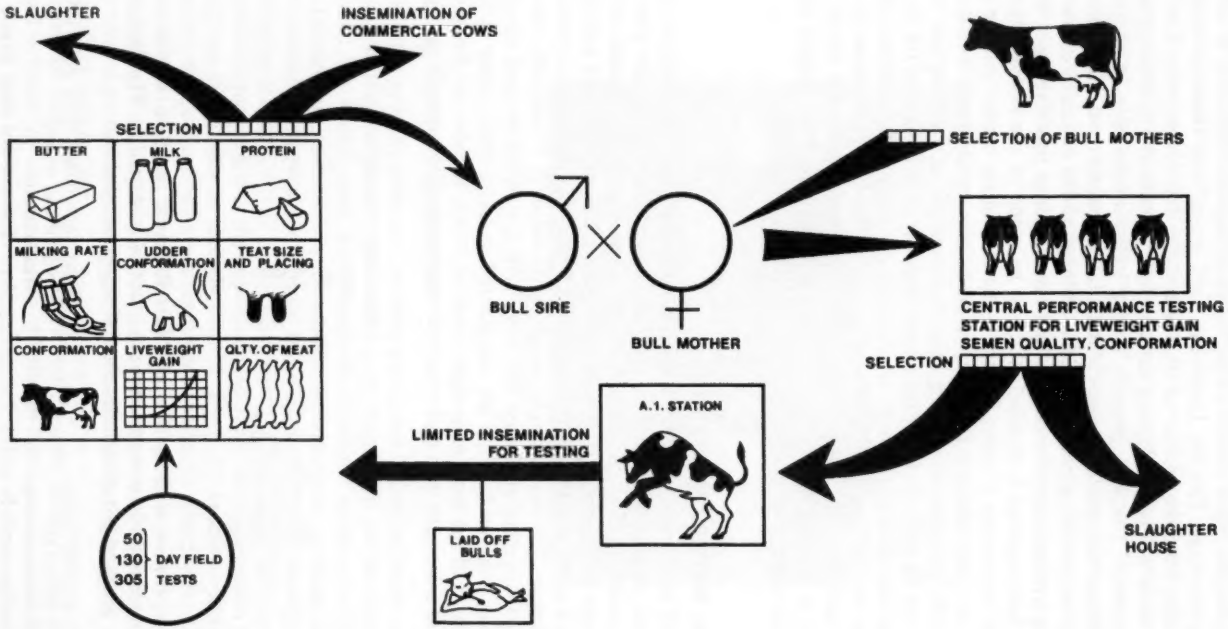
Bull calves will be performance tested in a central testing station for live weight gain and feed conversion; assessments will be made of semen quality and conformation. About half are expected to be discarded. Testing is at present being undertaken on a limited scale at some A.I. centres but there is virtually no selection.

That the programme includes selection for both meat and milk is surprising. However, by adopting a system of 'tandem selection', i.e., for growth and milk at different points in time, the Scandinavians consider the rate of genetic improvement for the latter will be virtually unaffected. An exhaustive study was recently made in Sweden in which, in a model simulation, 10,800 breeding alternatives were computed for a dual purpose breed with a population of 400,000 cows. One conclusion was that over thirty years total genetic improvement for milk production would be reduced only from 45 to 43 per cent.

The number of bulls to be tested depends partly on the intensity of selection required. It should be large enough to ensure sufficient survivors to approximate to the optimum required for the subsequent progeny test for milk. For example, in a population of 800,000 dairy cows, 450 bulls could be performance tested. Of these 300 would be culled, leaving 150 to be progeny tested for milk. If there were a negative genetic interdependence between growth rate and milk yield some of the bulls with the best milk potential would be eliminated. However, research workers in many countries have found no evidence of this.

Progeny testing for milk

Bulls which survive the performance test will be progeny tested for milk production. The optimum number in each batch depends upon such variables as the number of A.I. heifers available and obtaining a balance between numbers tested and accuracy of testing. Furthermore, economics and practicability must be considered. The optimum is larger than commonly used in A.I. breeding programmes and requires maintaining large numbers of 'laid off' bulls.



Blueprint of the Danish Cattle Breeding programme

The bulls which survive the performance test will each be used for about 1,000 inseminations from which it is hoped to obtain about 200 heifer records in milk recorded herds of milk yields, fat percentage and possibly, in future, protein percentage. This the Danes call 'field testing' and three assessments will be made from the results—at 50, 130 and 305 days respectively. The best bulls revealed will have offspring assessed both in milk and in meat progeny testing stations. The milk progeny testing stations have been in operation since 1945 and they evaluate yields of milk, fat and protein and conformation, special attention being paid to udders. Milking ability is measured also by recording average rate of milk flow and time taken to machine milk. These records have enabled a detailed study to be made of the heritability and degree of correlation of some factors in the three main breeds and the conclusions are that selection for superior productive performance would contribute little to improved milking time. For example, at a culling rate of 20 per cent for fat yield the likely maximum response in milking time for Jerseys would be no more than three seconds per generation. In contrast, direct selection for milking ability should produce rapid improvements in the milking ability of the three main breeds, the best criteria for which was found to be average rate of flow as opposed to milking time, largely due to the comparatively low heritability of the latter in Danish Reds.

Progeny testing for meat

One of the largest progeny testing stations for meat production in the world was opened at Egtved in 1967. It has accommodation for over 700 animals and is used to test thirty bulls at a time, and by the autumn of 1969 two groups of progeny had passed through the station. Eighteen bull calves from each of the thirty bulls to be tested are brought to the station in specially heated lorries. The test begins by weighing the calves at 15 days old, the next weighing takes place at 42 days and every 28th day thereafter until slaughter. Ten calves from each group are slaughtered as 'skim-milk' calves at 5 cwt liveweight, and the remaining eight calves at 9 cwt. Rations are designed to give good liveweight gain and muscle development. They reach a maximum of:

	'Skim Milk' calves lb	Young bulls lb
Skim milk	13	—
Concentrates	6	7½
Sugar beet pulp	5	9
Hay	¾	1
Straw	—	2

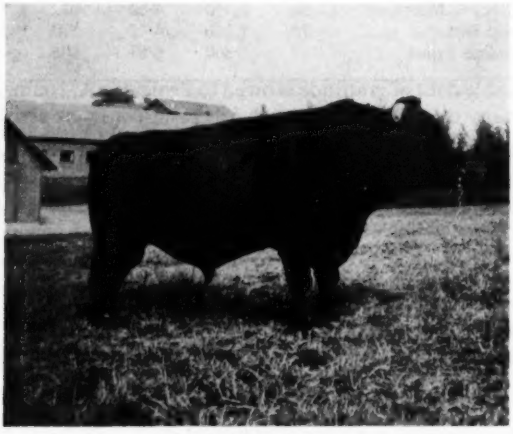
In co-operation with the Danish Meat Research Institute there is a complete assessment of the carcase for composition and quality. The final report on each progeny group includes the following information:

- Daily liveweight gain
- Daily carcase gain
- Food conversion ratio
- Percentage muscle fat and bone in the carcase
- *Percentage muscle in the 'pistol cut'
- Toughness of muscle
- Muscle colour
- Area of 'longissimus dorsi' muscle
- Muscle fibre diameter

*'pistol cut' refers to the largest and most valuable group of cuts and comprises round, rump, sirloin, fillet and forerib.

In the two tests so far undertaken up to the 5 cwt stage, the Friesians have shown a slightly better daily liveweight and carcase gain and percentage muscle in the carcase and pistol cut; Red Dane has surpassed the Friesian in terms of muscle quality.

Prior to the opening of the Egtved station 39 Danish Red Bulls were progeny tested by rearing 510 veal calves which were slaughtered at approximately 4 cwt. The calves were reared at 13 dairy progeny testing stations. Results from these tests and from Egtved showed that phenotypic correlations between growth and food conversion traits were high. Genetic correlations between growth and carcase traits indicated no strong genetic incompatibility in selection.



Danish Red Bull

Breeding the next generation

When the progeny tests are complete about one in four bulls are culled on the basis of their 'milk test'; those with poor 'meat tests' will probably never be culled but merely used less extensively. Research workers in Denmark have pointed out that there is a considerable advantage in trying to attain improvements in growth and carcase traits by performance testing prior to the progeny testing for milk rather than after the best dairy bulls have been selected. The reason is that the opportunity to apply intense selection pressure among the tested sires is severely limited, firstly by lack of numbers and secondly because the sires have already been subject to selection for the dairy characteristics and are, therefore, the most valuable survivors of a long testing procedure. It is to be hoped that resources will be found before long for a central performance testing station to complete the building requirements of the programme.

To get the best rate of genetic improvement only the very best sires will be used to breed the next generation of bulls. In every group of 200,000 cows only 3 or 4 sires will be used for breeding A.I. bulls. At first sight it would appear that this programme might result in a high degree of inbreeding but careful calculations by a number of geneticists indicate that this is not so.

The best bulls

The genetic potential attained by the breeding programme, coupled with excellent cowmanship, enables the progeny testing stations to achieve some exceptionally high average yields; last year, for example, one Red Danish bull (Elbo Sortemose) had a progeny test result for his heifer daughters of 1,145 gallons at 4·95 per cent fat. The highest yielding heifer group of each breed gave the following 304 day average yields.

Breed	Name of bull	No. of heifers	Milk		B.F. yield	Protein	Protein yield
			yield	fat			
			gal	%	lb	%	lb
Red Dane	Holbraek Morskaer	18	1,350	4·50	622	3·75	520
Friesian	Skive Bert	18	1,260	4·42	570	3·66	475
Jersey	Horsens Frank	19	860	6·81	605	4·26	380

A considerable debt of gratitude is owed to Professor A. Neimann-Sorensen and to the many others who gave such kind and generous assistance during my visits to Scandinavia.

The author, **G. K. Mathewson, M.A.(Oxon),** is a Livestock Husbandry Adviser with A.D.A.S. at Mirfield, Yorkshire. He has a special interest in cattle breeding and is a former member of the Scottish Milk Marketing Board's A.I. Committee.

Report on Lowland Sheep Production

The production policies and practices of lowland sheep producers in 1968-69 are examined in a report prepared by the Lowland Sheep Study Group and published by the Agricultural Economics Unit of the University of Exeter.

After analysing the changes which have taken place in the national flock from 1950 onwards, the report sets out the results of a postal survey designed to produce a broad picture of the industry. The survey represented all the farming conditions in which lowland sheep are kept, and covered an area accounting for about 60 per cent of the lowland sheep population of England. Information was collected on sizes of breeding flocks, breeds and breeding policies, the disposal of lambs, and on flock management practices, including stocking intensities, flock replacements and so on.

The results show a complex industry comprising a range of types of production, and demonstrate the versatility of a flock of ewes which can be fitted into virtually any farming system. Average flock sizes are increasing and the declining grassland acreage is being stocked more heavily, but there is no attempt to attribute the decline in lowland sheep production to any particular factors. The primary importance of fat lamb production and the need for economic studies of a range of lowland sheep enterprises are emphasized.

The report ends on a fairly optimistic note, foreseeing a reasonably good future for those sheep producers who meet consumer demand and who, through technical innovation and improved husbandry, achieve acceptable levels of profitability.

Copies of the report *Lowland Sheep-production Policies and Practices* can be obtained from the Agricultural Economics Unit, University of Exeter, Lafrowda, St. German's Road, Exeter, EX4 6TL, price 50p.

A commentary on three papers read at the Tenth British Weed Control Conference, held in Brighton, 16–19th November, 1970.

Weeds and the Environment

S. R. O'Hanlon

AT rock bottom, farming, in all its facets, is simply the manifestation of man's discontent with an unimproved state of nature. Where he seeks to secure for himself a more sympathetic environment for the production of his food in adequate quantities, it is often, and necessarily, only at the expense of that which is supporting other forms of life. Some are demonstrably harmful to his designs, others may operate in his favour. It is a shadow area where cause and effect are not sharply outlined and the controversies that increasingly engage the minds of agriculturists and conservationists are nourished in isolation. It has nevertheless to be accepted that in terms of survival and reproduction man is demanding an ever bigger slice of Nature's cake.

Changing weed populations

Here, basically, was the force motivating the Brighton conference,which narrowed its focus of interest on to the ubiquitous competition of weeds for our soil resources. If suddenly an economic use were to be discovered for, say, charlock or chickweed, no doubt we should start to cultivate them assiduously instead of spending colossal sums in an attempt to eradicate them. As it is, recent East Anglian surveys have shown these two species of naturally proliferating flora to top the list of the most common dicotyledonous weeds in cereal crops in that area. After the intensive chemical weed control which has marked the past twenty years and the greater attention latterly given to routine spraying, we might expect the arable weeds problem to be receding. But what evidence, asked J. D. Fryer and R. J. Chancellor in their paper, have we to support the claim that the great weed problem of yesteryear, such as charlock and corn poppy, have declined substantially and that herbicide-resistant weeds, particularly grasses, have increased in importance?

Long-term experiments on weed populations have been few, and of those on arable land only one has been long enough to show any significant trend. This was in southern Germany over the years 1948–65, and it revealed that the numbers of annual weeds easily controlled by herbicides definitely declined during that period while, at the same time, there was an increase in grasses, notably couch, rough-stalked meadow grass and wild oats—findings which have tended to be confirmed in East Anglia. The changing incidence and diversity of weed populations in Britain cannot be guessed at, but requires comprehensive and reliable information by which to plan the future

strategies of control indispensable to research workers, advisers and farmers alike. In 1968 the Weed Research Organization appointed a Surveys Officer specifically to help satisfy this need, and several projects, including collaboration with agricultural merchants and students, are in progress.

'In spite of the increasing use of herbicides', said the authors, 'it seems that weed flora may perhaps be able to maintain its diversity of species. Indeed, it has been suggested (by E. F. Sullivan) that it may even increase as new niches are opened up by the control of hitherto abundant and competitive species or by changing management practices . . . It seems reasonable to conclude that the great majority of the well-known dicotyledonous weeds of arable land are still as widely distributed as hitherto, although some are undoubtedly much diminished in numbers.' Grass weeds of all types are believed to have increased dramatically, and perennials in general seem to have more than held their own in spite of the intensive use of herbicides. It is a matter for speculation whether the diversity of species will be maintained or will tend to decline over a longer period of time.

The goal of a weed-free environment is not necessarily a mirage, although reaching it could be delayed for economic reasons. An increasing diversity of weed flora might occur as between areas under high value agricultural and horticultural crops and those where cereals or animal husbandry are extensively the main enterprises. The essence of the struggle of man versus nature resides in his technological ability on the one side and the evolutionary adaptability of weed species on the other. The present evidence suggests that in the near future weed populations will continue to decline in density but not necessarily in diversity. Hence the need to pursue control measures rigorously if ground gained is to be consolidated and a resurgence of former problem weed species is to be checked.

Rate of weed increase

In his paper on the subject of factors controlling the size of plant populations G. R. Sagar, of the University College of North Wales, looked at the relevance of the Darwinian concept of the geometric potential of increase. Crop ecologists have long controlled the size of their plant populations within narrow limits, but the pertinent question before the conference was to direct attention to those plant species for which man does not (and perhaps cannot) yet control seeding rates. It is fortunate that the prodigal bounty of nature which provides thousands, even tens of thousands, of seeds per weed plant (common ragwort produces some 63,000) is cancelled by adverse environmental factors, so that only a relatively few survive to complete a full cycle. Pre-emergence mortality by reasons of fluctuating temperature, high humidity and soil-inhabiting predators and parasites is heavy. 'The partition of responsibility for losses of seed in the soil seems to be a long way beyond our present knowledge' said Dr. Sagar, 'and yet the size of the loss is of a magnitude which would seem to offer a fabulous potential for improved pre-emergence control of population size of annual weeds in particular.'

Our knowledge of the extent of the natural loss of seedlings which occurs soon after emergence is regrettably small, and Dr. Sagar thought that the use of pesticides as tools for ecological research, together with time lapse infra-red photography, would help to lighten our ignorance of the fate of seedlings which disappear without trace. In the post-establishment stages

environmental factors obviously play an important part but, asked Dr. Sagar, are they really significant in controlling the size of plant populations? Regard must be paid to the differences between annual and perennial species, the former setting seed under the most severe conditions of interference, whereas perennials frequently appear to play the waiting game, with some adding to the potential population by their facility for vegetative reproduction. How great, too, is the limitation of seed production by insect predators and parasites? We need to know more about the agents of mortality normally regulating weed numbers. Parts of the life cycle have been studied by many reseachers, but little has been done to synthesize the whole from the parts. It was Dr. Sagar's plea that at least for the weeds of major economic importance such synthesis is now desirable, not only to expose the gaps in our information but also to assist identification of the particular stages when a start may be made on the identification of the responsible agents.

Weed control and conservation

Whilst the scientists seek constantly to give the farmer the optimum environment for food production, the conservationists look upon the growing use of herbicides/pesticides with alarm and warn of retribution to come. Chemical control, with, in some instances, its resultant and persistent toxic residues, are dangers, they say, to which life associated with natural environments should not be subjected. But, as Dr. N. W. Moore, of Monks Wood Experimental Station, emphasized in his paper, polarization of attitudes into pro- and anti-pesticide camps is unscientific and bad for both agriculture and conservation. Common ground is found in that each is concerned with the basic requirements of mankind; the differing views stem from the difficulty of reconciling short- and long-term aims. 'Mankind requires food, health and culture', said Dr. Moore. 'Pesticide manufacturers and users serve preventive medicine and food production; and since a starving and unhealthy man has little use for culture, pesticides also indirectly serve culture too. Conservationists, by maintaining biological variety, serve science, education and recreation, but their concern for the environment and their study of it also indirectly and increasingly supports agriculture and preventive medicine.' In the emotive atmosphere which has come to envelop the controversies concerning the use of agricultural chemicals, no better balanced statement than that could be wished for.

Dr. Moore foresaw that in the future most of our food will be produced on intensively cultivated land which will become progressively less suitable for wild life. As a result more land will have to be set aside specifically for conservation. Co-operation on pesticide questions between the agricultural industry and conservation bodies, both official and voluntary, in the United Kingdom has shown that the artificial and harmful barriers between the two groups can be reduced and practical compromises achieved.

Man's environment can never be a separate department of nature. It is in the order of things that it must be shared. As a new countryside evolves under the influence of new technologies and economic and social pressures, weed control and wild life in all its diversity have to be seen in this context.

Dairy Carousel

L. M. Parsons, *A.D.A.S., London*

FOR those with an historical turn of mind, the development of the mechanical process for milking cows over the past 100 years makes a fascinating subject of study.

For most of this period, many clever and inventive minds were busy refining the machines and methods for getting the machines to the cows and their milk to the dairy, and generally treating the cow with all the care due to a hospital patient. The cows did in fact require nearly as much attention as human patients, with jobs like feeding and cleaning, particularly in the winter, seeming to be never-ending. As for the men themselves, although for the most part in warm and cosy surroundings, they spent far too much time walking, carrying, pushing and lifting.

Birth of an idea

The work of a farming genius on the Wiltshire Downs in the 'twenties was soon to start a radical process of change in these traditional methods. We have probably yet to see the culmination of a lot of the fundamental ideas of Arthur J. Hosier. Like so many brilliant ideas, his was simple enough—'Bring the cows to the men and machines'. This basic idea has enabled farmers to effect large savings in the time and effort needed to do all the tasks inexorably bound up with keeping a dairy herd.

The associated developments and refinements of his system have led to all kinds of novel and better ideas. For instance, self-fed silage, automated bulk feeding, the whole concept of loose housing, and mechanical dispensing of concentrates in the parlour, have all developed from the mobile bail. Now there are covered and semi-covered yards, cubicles and kennels and all their many permutations and combinations.

Herringbone problems

So far as the tasks of housing and feeding cows are concerned, a sustained programme of research and development has paid very big dividends in improving productivity in dairy farming. The actual process of milking has been even more thoroughly explored in every detail and the best methods widely publicized and demonstrated. No one can possibly plead a lack of basic information.

Nevertheless, even in the most up-to-date herringbone installation, the milkers still have to do a fair amount of running about. At the same time they have to maintain a strict work routine, virtually to the clock, and spend a lot of time in rather confined surroundings not always best suited to sustained comfortable effort. They must be on their guard continually to avoid a severe hold-up in the process, or incorrect feeding, or incomplete milking and to maintain a high standard of hygiene. Probably as important a factor to the farmer is that the men who work these outfits have to be

highly trained and skilled at their job, and must be masters of stockmanship to achieve consistently good and reliable results. Of course, they must have the proper facilities and conditions to enable them to maintain the system, particularly under present conditions when herds are increasing in size and more time has therefore to be spent milking.

The first rotary parlour

These basic considerations led the Walker-Gordon-de-Laval concern, of Plainsboro', New Jersey, to deduce that considerable savings in walking and relief from the pressures exerted on workers and cows by customary parlour milking routines might be achieved by moving the cows rather than the men.

Over thirty years ago this firm designed and built the original rotating parlour to cope with about 1,500 dairy cows and thus ushered in the era of the industrial conveyor belt milking factory. The installation, which they called the Rotolactor, had the advantage that the cows moved around the men, who were relieved of many of the stresses and strains inherent in static types of parlour. Equally, much less walking was necessary, and the staff could, therefore, milk for much longer periods or even change to shift conditions, an obvious advantage where large herds are concerned.

Labour needs

Another great advantage of a rotating parlour is that it can enable a whole range of automatic operations to be undertaken more easily. Although this may not have been foreseen when the Plainsboro' installation was built, great strides are now being made with the aid of new electronic devices for the control and operation of various parlour processes like removing clusters, feeding concentrates and so on. Thus it is that some people feel the day of the factory-style mass-production worker is drawing ever closer to our farms.

However, even this has some applications worthy of consideration. Although large factory-type dairy enterprises do not necessarily economise on labour in general, they do open the way to a need for fewer really highly trained and experienced men. Most of the jobs in a rotary parlour can be described as being virtually unskilled or requiring only a minimum of training. But there is a real need for the man in charge of the whole operation to be an expert not only at the job of milking, but also skilled and knowledgeable as a manager of livestock.

Today, it is not only the proprietor of the very large herd who is interested in rotary parlours, for there are many smaller herds where some of the advantages might be used. It must be admitted that such a parlour has an air of spaciousness and clinical technology which is often absent in herringbone or other kinds of parlour. Certainly the job of the operator is less arduous and demanding—there is room to move freely, thus lessening what can so easily be a sense of frustration and claustrophobia. The smaller types with, say, five to ten stalls, can often be of the 'Stop-Start' type which greatly lessens a man's feeling of being geared to a machine. This allows his sense of stockmanship more freedom and gives him the feeling of being 'in charge', which is often absent in a herringbone.

Rotary designs

The original Rotolactor, and those which developed quickly in many

countries, like the Onslow-Walker-Gordon model in Australia, are suitable for very large herds of 500 to 1,500 or more. The cows reach the revolving platform at ground level or by means of a ramp, and stand side by side before leaving by means of an underpass at the centre of the installation. The operators work on the perimeter of the platform.

Another design is the rotating tandem, in which the cows stand head to tail, and enter and leave from the same level, thereby eliminating the need for an underpass or ramp system. The operators occupy the central working area and can see and closely check the whole process of milking, a significant difference from the Rotolactor.

Other variations are practicable and the rotating herringbone or elongated circuits are now beginning to be tried out in practice.

Performance comparisons

Whilst undoubtedly the process of milking has been streamlined, and there are many facts and figures to support this claim, only the speed of rotation and work routines can in the end determine the number of cows which can be put through such a plant in a given time. It is not, therefore, possible to attempt to compare the performance figures of rotating parlours with the static types unless they are assessed under actual working situations. Both depend on prevailing conditions and theoretical claims must be proven on the farm.

Marshalling problems

At the same time, there are considerations apart from milking which need to be taken into account when comparing rotary parlours with more conventional types. Labour quality has already been mentioned and, this too, is concerned with the marshalling of the cows for milking, particularly with herds of several hundred. As with so many improvements to a part of a process, there are frequently greater difficulties imposed elsewhere in the system. It can be said today that there are not many real difficulties in actually milking cows, but getting them to and from the milking place is becoming increasingly complicated. With small one-man herds this has been overcome fairly easily by means of circular gates, electric dogs and so on; and the use of the 'Pie-shaped' housing system for larger herds certainly simplifies cow movement. But with any other form of housing, particularly the cubicle or yard system so common today, the bigger the herd the more difficult the problems of cow movement become.

An operator can easily leave a herringbone parlour if he needs to, but not so with a rotary parlour. In the latter case absence would inevitably cause serious disruption because the assembly and dispersal of the cows assumes greater importance. A theoretical study was made of shift milking 1,300 cows twice a day with a 32 point rotating parlour, with cows housed in blocks of 75 in mechanically fed cubicles. It revealed very clearly that the order of milking, cleaning and feeding and the necessary movement of cows would have to be controlled within very tight limits if the system was ever to work. Losses of only a minute or two per batch of cows could create insuperable problems. The job of marshalling gets more complicated and difficult than that of milking in the parlour and becomes the key operation on which success or failure depends. This aspect is of great importance when the use of a rotating parlour is contemplated in some existing situations, and it cannot be emphasised enough that a 'paper run' is vital.

Need for caution

Finally, whilst rotating parlours are extremely reliable mechanically, prudent provision must obviously be made for a 'Fail-safe' operation in the event of an emergency. Looking to the future, managerial problems will certainly increase, and more and more attention will have to be given to turnover of cows and labour, maintenance of yields and so on, snags which have so far bedevilled most outfits. On economic grounds it is clear that these large installations are expensive and require a lot of planning and managerial effort before and during operation. The smaller kinds on the other hand have some significant advantages for the men who have to work them, although these cannot be measured effectively at the moment. For many farmers the cost of installing and using them may well be justifiable on grounds other than pure cash outlay.

The following table has been constructed by carefully checking all available facts known to skilled observers. It does go some way to show that, with the best will in the world, only a fraction of the claims really better a reasonable performance in more conventional parlours when expressed as throughput of cows per hour. But, as has been stressed above, the less tangible benefits cannot be measured.

Table I—Rotoparlours Compared

Location	Type	Number of stalls	Herd size (gross)	Total Workers		Throughput claimed expressed as cows per hour
				Whole unit	Milking included in whole	
Italy	Rototandem	25	350	4	3	136–140
,,	Rototandem	25	250	4	3	136
,,	Rototandem	16	600	4	3	130–140
France	Rototandem	18	250	3	2	130
,,	Stop-Start	6	48	1	1	55
,,	Stop-Start	5	24	1	1	55
,,	Rotolactor	30	—	4	3(1pt)	130–144
U.S.A.	Rotolactor	50	1550	7	5	300
Australia	Rotolactor	50	1100	8	6	348
Germany	Rotolactor	40	1000	9	6	250
U.S.S.R.	Rototandem (fully automated)	38	600	5	3	300
New Zealand	Rotolactor	14	115	2	2	100
Romania	Rotolactor	32	1100	5	3	250
United Kingdom	Stop-Start	8	150	N/S	1	70–90
,,	Stop-Start	6	N/S	N/S	1	55
,,	Rototandem	13	160–170	2	1	100
,,	Rototandem	10	N/S	2	2	120
,,	Rototandem	16	N/S	3	3	150

N/S = Not stated

Incidentally the word Carousel, which is used universally to describe these machines, derives from the French word for Roundabout. We must be careful to see that the possible gains on the not-so-magic roundabout are not lost on the swings of lowered standards of livestock care.

Aerial Photography of Drainage Systems

J. G. Twocock

SOME large old estates are fortunate in that there are plans and details of drainage schemes dating back to the 1840s which have allowed tenants to maintain or successfully recondition old systems. Most old schemes, however, lie forgotten. If they were easily traceable it could be of considerable value in deciding what drainage work is really necessary. Wet areas may be due only to blockages in an old system, and it may be found that cleaning out and reconditioning old pipes is all that is required. It is possible that an old scheme, even of 100-year old drains, can be made to work satisfactorily, perhaps instead of and at much less cost than a new scheme.

Use of aerial photography

Aerial photography is widely used in archaeology and the casual inspection of almost any aerial photograph of the countryside taken on a scale of 1/10,000 or larger usually indicates not only signs of old field boundaries and roads, but also the herringbone pattern characteristic of many tile drainage scheme layouts.

Plate 1 is a photograph of a small area of Cambridgeshire approximately four miles south-east of Ely. Fields X and Y can be seen to have been intensively tile drained, although the owners have plans to install further land drains in the heavy clay. When studied in detail both fields are seen to have a close spaced system (drains 11 yards apart), crossed by a chain apart system; a third system at 11 yards centres can be detected in field X. There is also an indication that the outfall for the widely spaced system is a main running diagonally across the field west of X. Only the chain apart system was known to the owner, but not when it was installed. The outfall main dates from 1954, but this pipe could be a replacement. Some of the drains could be over one hundred years old.

This photograph, taken in June 1966, seemed to indicate clearly the feasibility of using aerial photography for detecting drainage schemes. But a similar study in the Oxford Clay area in 1958–61 of Dorset had concluded that:

(*a*) only recent schemes, no more than two years old, show up on aerial photographs, and

(*b*) what looked like tile drainage layouts on the photographs turned out to be surface channels on the ground.

The evidence of the value of aerial photographs for drainage purposes, therefore, was conflicting and it was decided that a thorough investigation would be of value, particularly if more recent photographs could be studied.

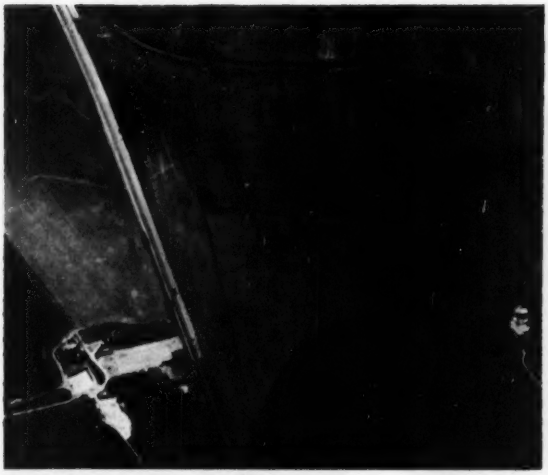


Plate 1 showing fields X and Y

The Witchford-Stretham mosaic

Fortunately a larger block of land in Cambridgeshire had been photographed for the N.A.A.S. in 1967 and these photographs proved ideal for the study. Not only did they cover an area where detailed soil mapping and crop recording had been carried out, but both panchromatic and infra-red photographs were available. For convenience the photographs were trimmed and joined to cover an area extending approximately 4½ miles north to south and 2 miles east to west at a scale of about 1/9,280. Two maps, or mosaics, were produced, one panchromatic, the other infra-red; parts of prints forming them are reproduced overleaf for comparison. Infra-red photography records heat rather than light differences and is, therefore, useful for comparing hot and cold objects, such as wet and dry land (see plates 2 and 3 overleaf).

The Fen island on which Ely Cathedral is situated is the major topographical feature shown on the mosaic. Unfortunately the flight path stopped short of the Cathedral so it does not appear on the photographs as a location mark. The Greensand ridge, which reaches an elevation of 87 ft A.O.D. (above Ordnance Datum) at the north-eastern end of the mosaic, slopes down to the fen, with gradients of up to 6 per cent in places along its edge.

Basically the ridge has a chalky boulder clay capping, and peat areas are to be found near the Old West River (former course of the River Ouse) at the southern end of the flight path. Between these two areas is the skirtland which is here predominantly a clay containing a little organic matter in the surface layer.

The bulk of the known drainage schemes are located on soils of the Wicken (Chalky Boulder Clay) and Peacock (Skirtland) Soil Series.

Evaluation

Six inch to the mile plans (1 : 10,560 scale) of the area covered by the mosaic were obtained on which all known grant-aided drainage schemes were plotted. Most of the schemes plotted were less than ten years old, for although plans for schemes have been required since 1940, many earlier

ones were unreliable or difficult to locate. When this job was completed the aerial photographs (both pan and infra-red) were scrutinized to see if the drain lines were visible, barely visible, or not detectable.

Plate 2 Panchromatic film

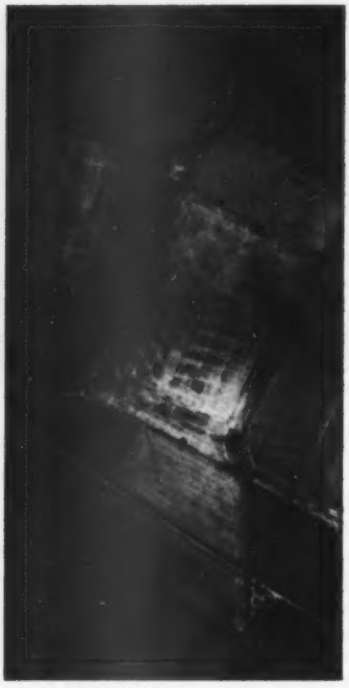


Plate 3 Infra-red film

On the pan mosaic there were 73 known schemes and of these 21 could be detected, 10 could be partially detected, and 42 were completely invisible. The infra-red mosaic (covering a slightly different area) was not so rewarding; the number of detectable schemes was only 13, whilst 6 were partially visible and 56 could not be spotted at all.

These results tended to confirm the conclusions made in the 1961 survey that the use of aerial photography to detect old drainage systems was limited. It was, however, decided to sift the data to see if the limitation was due to the:

1. age of the schemes;
2. presence or absence of gravel backfill on the drains (change in depth of soil);
3. crop in the field;
4. soil type. (This factor would be of more importance if the photographs were of bare land and changes in soil colour could be detected. As the 1967 survey was flown on 5th June all the fields had a good crop cover. In soil types which have distinct horizons of varying textures trenching would produce a new profile which might give rise to variations in crop responses.)

In the table these factors are analyzed to see if the detection is influenced primarily by one field condition. The results are for the panchromatic film mosaic. Some details of the infra-red photography are also tabulated but in the exercise these results were not as good as those obtained on panchromatic film.

Table: Analysis of factors aiding detection of schemes

Factor	Details or comments	Percentage visible	Percentage partially visible	Percentage undetectable	Number in sample
Age of scheme	1953–1957	22	33	45	9
	1958–1962	10	14	76	21
	1963–1967	40	9	51	43
	1953–1967	29	13	58	73
Gravel on drains	22% of total	13	12	75	16
Crop	Cereals	26	28	46	54
	Sugar Beet	30	10	60	10
	Potatoes	—	20	80	5
	Grass	50	—	50	2
	Onions	—	—	100	1
	Beans	—	—	100	1
					73
Soil type* (by Series)	Wicken	26	n.a.	n.a.	35
	Peacock	23	,,	,,	35
	Oakington	33	,,	,,	15
	Stretham	60	,,	,,	5
	Bracks	13	,,	,,	16
	Chittering	33	,,	,,	3
	Hanslope	50	,,	,,	2
Infra-red photography	1953–1957	20	10	70	10
	1958–1962	14	4	82	22
	1963–1967	19	9	72	43
	1953–1967	17	8	75	75

*42 per cent of the fields in the survey area had variable soils. Number in sample includes part schemes.

n.a. Figure not available.

Age of schemes. As a generalization new schemes were easier to detect than old ones, but the table shows that in the period 1953–1962, older schemes were more readily detectable than the newer. On a yearly basis, schemes laid in 1963 showed up better than those installed subsequently. The age of a scheme cannot, therefore, be the most important factor.

Gravel backfilled drains. The results indicate that these drains are more difficult to detect than those with soil over the pipe.

Crop. Unfortunately the records do not distinguish between wheat (in this area usually winter sown) and barley (spring sown). On Plate 1, field Y is

in wheat and there is a crop of barley between Y and the railway line. Drain lines are more difficult to detect in this field indicating that responses to soil moisture deficits vary from crop to crop. On the mosaic if all small samples are ignored (less than 10), the figure for detectable drains in cereals and sugar beet was about the same, approximately 28 per cent.

Soil type. Once again if small samples are ignored, a figure of about 27 per cent is the detectable rate on a wide variety of soils. There is an indication that drains laid in sandy soils (Oakington Series) show up better than drains laid in clay (Wicken, Peacock and Bracks Series).

Soil moisture conditions

Drain lines can frequently be detected on the ground by eye as areas where the crop growth is more vigorous and a darker green in colour, although care has to be exercised as uneven fertilizer distribution can give the same results. These zones are more readily detectable in crops with a cover approaching 100 per cent (such as grass or cereals) than in root crops in the early part of the season. Many farmers have suggested that a dry period in the spring usually gives the conditions required to see old drains and to some extent this theory is supported by the evidence of aerial photography. Three sets of photographs taken in the Ely area of Cambridgeshire have been examined and the most impressive photographs are those taken on 19th June 1966, which includes Plate 1. The detailed study of the Witchford-Stretham area was based on photographs taken in June 1967 and part of this area was surveyed again in June 1970. This latter survey has not been examined in detail but the general indication is that the number of detectable drainage schemes is less than that shown on the 1967 mosaic.

Estimates have been made of the soil moisture deficit at the time of the various sorties as follows:

19th June 1966—3·49 inches
5th June 1967—1·01 inches (May 1967 was the wettest since 1773)
3rd June 1970—2·29 inches

The above-average soil moisture deficit for early June 1966 would appear to be the major factor in showing up the old drainage systems. There is no apparent explanation for the variation in results for the 1967 and 1970 photography.

Conclusion

There are many forgotten drainage schemes scattered around the country, some of which with a certain amount of reconditioning could be made to function again. Finding these old pipes can be a laborious process and so any technique which can be used to locate old systems should be investigated.

Aerial photography promises to be one effective way to re-discover neglected systems but the detection rate is disappointingly low. Further studies similar to those carried out in Cambridgeshire are necessary before aerial photography can be considered a viable proposition in land drainage.

The author, **J. G. Twocock, B.Sc.,** is an Experimental Officer with the Field Drainage Experimental Unit at Cambridge.

This article describes how, by using polythene, some farmers in Yorkshire and Lancashire have attempted to conserve grass in small packages for winter feeding.

Baled Silage or Bagged Grass?

Robin Crawshaw, *A.D.A.S., Leeds*

VISITORS to the hill areas of Yorkshire and Lancashire last summer will probably have noticed an unusual feature in the scenery. What appeared at first sight to be parallel rows of sheep spread out across the fields were found on closer inspection to be bales of grass wrapped in polythene bags!

New method of conservation

There has been a minor boom in this new method of conserving grass and it is worth considering the system used to enable it to be put in perspective.

Grass is cut and baled immediately or after being left to wilt. A heavy duty (800 gauge) polythene bag is then slotted over the bale. The neck is gathered and sealed with a wire tie, and then doubled over and fastened with a second tie. The bales are normally taken back to the yard for storing but they can be left in the field, possibly for feeding to out-wintered sheep.

When this system was first publicised about three years ago there were only the claims of the innovator from which to draw conclusions; and there were a number of questions remaining to be answered. To obtain some answers an opinion survey amongst farmers with experience of the system was conducted at the end of the 1969/70 winter.

Results of experience

Sixteen farmers in Yorkshire and Lancashire were involved in the survey. They had a total experience of 8,500 bales made from 90 acres of grass—equivalent to perhaps 400 tons of silage. Most had tried the idea for the first time in 1969 and had made fewer than 500 bags each, though some had more experience and had made up to 1,000 bags.

Much of the material bagged was surplus autumn grass, difficult to utilize in any other way. Some was cut, baled and bagged in a single day, some deliberately wilted for 2-3 days, and some salvaged from the remains of a hay crop which had been tossed and turned for twelve days. There was a strong feeling in one area that the wilted material was superior to the fresh, and certainly the bales were lighter. But others insisted that wilting was unnecessary and only complicated what was a simple job. Their comments are categorised below.

Sealing. An air-tight seal was easily achieved and small holes were almost self-sealing when the bags were stacked.

Vermin. Bags were definitely not vermin proof and one farmer lost half his stock of 500 to invading rats from a nearby reservoir.

Cost. In general, damage to bags has been small and they have been re-used with success, sometimes after the repair of small holes. Thus the initial cost—equivalent to nearly £8 on a ton of hay—can be cut to more reasonable proportions.

Capacity of Bags. It was usual to get a full size maximum density bale into each bag. Bale weights depend on moisture content and have varied from 60 to nearly 200 lb, with the majority being around 100 lb. Weight losses, where measured, have been surprisingly small at 1–2 lb per bag, though dry matter losses could be proportionately higher. Fermentation losses may be expected to be small though; this aspect is currently being studied in some detail. The author is examining detailed information of the weight and nutrient losses experienced in bales made last summer; this will become available when the bags are opened and fed to stock.

Handling. Handling might have been expected to be an overwhelming problem. How could farmers cope with parcels of such size, without strings and without damage? Answers to this question varied from 'No more difficult than hay', to 'Awkward', 'Boring', and 'Impossible to lift and glad to be finished with it'. No one pretended this to be a push button or tractor seat job, but fifteen of the farmers intended to repeat the exercise. The lone dissenter was the man with the reservoir, the rats, and the remains of last year's bales still rotting on the farm.

Feeding. It would be foolhardy to compare feeding with other feeds in other years, particularly with only one year's experience. But all farmers were satisfied with the way it fed and particularly with the condition of their cows. One feature which was emphasized on every farm was the extreme palatability of the 'silage'. In spite of a variety of in-going materials, including rained-on hay and grass that the cows would not eat, the farmers had a winner every time. Sheep liked it, calves liked it, and so did horses, cows, pigs and rats. As one farmer commented 'They ate every scrap (including the mould) and even preferred it to dairy cake'. The general opinion was that it was better than hay in all respects with 'No waste in field'. One farmer made a thousand bales from the edges of his hayfields and under the trees where hay in other years had never dried.

Analytical data

Fifteen samples have been analyzed and the results are summarized below. They are characterized by an apparent lack of fermentation as shown by the high pH values, and only one had any trace of secondary fermentation.

	% D.M.	% C.P.	% M.A.D. Fibre (7 only)	pH*	Fermentation	
Mean	29·2	13·3	37·3	5·2	2 good	satisfactory
Range	16·3–62·5	10·0–19·7	31·1–43·1	4·1–6·2	8 satisfactory	
					4 little fermentation	
					1 slightly butyric	

*Only 4 pH values were below 5·0.

Development of machinery

A firm in Yorkshire, with the aid of a grant from the National Research and Development Corporation, is working on a machine that will harvest, bale, bag and seal the grass untouched by hand; they have already managed

to harvest and bale grass automatically. The machine would also put each bale into a bag if the latter were manually fitted in the right place. The company is currently reviewing the whole question of optimal bale size and shape, and whether the bale is in fact the most convenient package.

The system in perspective

The system of grass conservation described above is obviously no competitor for tower silos or self feed/mechanically unloaded clamp silos. Labour productivity is an essential feature of these systems, and even with the introduction of the baled silage harvester the work involved at feeding would be inhibitory. However, vendors of equipment for barn hay drying must take note of this development. The extra handling and costs involved in barn dried hay could be comparable with those of baled silage. The palatability of barn hay is well known—but is it better than this new product? Dry matter losses could well prove to be higher for hay.

Field-cured hay has never compared favourably with barn dried hay except in the rarest of summers. So how does it compare with baled silage? In good weather hay is lighter, faster and cheaper, and without doubt a better bet. But with a heavy crop, or when conditions are dull, or grass heavily fertilized much time and money is wasted knocking leaves from stems in an attempt to get some part of it dry. Digestible dry matter losses are high in such a crop and the effort spent turning could be used for steadily bagging a better quality crop. Where a lot of hay is made it would appear to be a superhuman task to bale two or three times as much and wrap it all in polythene. And the work involved in feeding, say, fifty cows all winter on a full ration of baled silage is frightening. But arguments of work load, product quality and of independence from adverse weather conditions have often been used to press the advantage of silage over hay—but haymakers remain loyal and unimpressed. Perhaps they will take to baled silage more readily than other forms of silage, it being a less revolutionary change, and having the less obvious benefit of being able to make hay when practicable.

Conclusions

Though it is difficult to foresee this method of conservation becoming widely adopted on large farms, it could have a place where there are small surpluses of grass, e.g., from paddocks or during the autumn. In years when hay crops are light and substitutes expensive, the salvage of some September and October grass could have an effect on profits. The palatability or acceptability of the material cannot be denied in the light of the claims made by those who have used it and few would deny the importance of this aspect.

At first sight baled silage is a step backwards to the days when labour was plentiful. But the majority of farmers in the survey thought that baled silage was easier than hay. Comparative work over a number of years is needed to show whether the extra bale handling would be more or less time consuming than tossing and tedding a half-made hay crop, and the benefits and the costs of the system will become more clear when further information is available on dry matter and nutrient losses.

It has been the aim of much research to convert surpluses of grass into high quality feed for the winter. Some farmers refer to this product not as baled silage but as bagged grass, and some of the material at feeding resembles grass more closely than silage. Many farmers would think it worth some effort to be able to have grass to feed in the depths of January and February.

The author discusses in this article how the restoration of former industrial land and the use of certain industrial by-products are helping agriculture in Glamorgan

Industrial Waste and Agriculture in Glamorgan

Brynmor Rees

THE modern British landscape is a most remarkable achievement, for few other areas in the world have been so developed or humanized. During many centuries, progressively and unobtrusively, singularly vigorous inventive races devoted their energies to adapting the primeval countryside to their needs until, finally, the ancient waste surrendered its resources to the exploitation of man.

When the industrial tide of the last century receded, it left behind a vast flotsam of spoil heaps, decaying buildings, polluted air and water, disused canals and blasted vegetation—man's humanity, or inhumanity, to the good earth. To many these appear as a black monument of remembrance to an age that saw wealth as strictly a one-way deal; yesterday's unquestioned equation 'muck = money' has created some unpleasant arithmetic today.

Nowhere is the 'rape of the fair country' better illustrated than in parts of industrial South Wales. Like industrial wastelands everywhere, they offend the eye and what is one of the world's most civilized landscapes; they sour the surroundings and threaten a much larger area than that on which they perch like some bird of prey; and they contribute in full measure to what we have now come to call twilight areas.

Reclamation

There is a compensating factor in all things. Time is a great healer. In the wake of a vastly changing world, the development of a new public awareness of industrial eyesores and the immeasurable natural wealth of an improved environment is welcome and reassuring. Fortified by recent legislation and the establishment of a Derelict Land Unit, a number of large-scale reclamation schemes are now under way in Glamorgan and at last the great expanse of industrial dereliction has been injected with a massive dose of hope.

Although conventional reclamation and recovery of industrial waste are closely related to industrial development, invariably they encroach on the preserves of agriculture, affecting it both directly and indirectly, but often to the point of mutual benefit.

Within this category are various forms of restoration—coal, gravel and iron ore; depositing power station pulverised fuel ash; coal extraction and disposal of colliery slag tips; utilization of hoof and horn offal; lime and sewage sludge; railroad rails and sleepers; wood pulp and sawdust; and, if an industrial status can be conferred on modern pig and poultry factory enterprises, then the disposal of muck can be included.

During 1970, European Conservation Year, with pride of place vested in the reclamation of derelict buildings and coal tips, it was anticipated that over 2,000 acres of land in Glamorgan would be released for industrial development and an equivalent acreage for agriculture, afforestation, parks and playing fields, an operation both timely and rewarding.

Included in this acreage are the catastrophic Aberfan tips, now in process of removal to some 400 acres of land destined for agricultural purposes. The rate at which the familiar pyramid structures are disappearing may be assessed in the light of one suggestion on the future of the Rhondda 'that one famous multi-million ton tip should remain for posterity in memory of the halcyon days of coal mining'.

Opencast coal—restoration of land

Out of a total of 12,700 acres devoted to opencast mining, 4,750 acres have been restored, 3,780 for agricultural purposes and 970 for afforestation.

Large scale opencast working began in Britain in 1942 to supplement output from the deep mines, and from the first the Ministry of Agriculture had the responsibility of giving the worked land a special course of cultivating, fertilizing and cropping to make it reasonably fit for agriculture. This work was carried out initially through the War (later the County) Agricultural Executive Committees and their services, but in more recent years has been undertaken by the Ministry's technical officers as agents of the National Coal Board. Conditions attached to consents for either prospecting for or working the coal are nowadays the means by which worked land is left in a fit state for cultivation, with the result that each year a certain amount of land is being restored and returned to agricultural use.

A few decades or so ago, many an original sward, the habitat of the mountain hare, might have resembled the colours of Jacob's coat, but following coal extraction and restoration it now rightly approaches the status of the 'green green grass of home'.

Power station pulverised fuel ash

In spite of its appearance, this uninviting waste material is fast becoming a marketable commodity whose demand more than equals the supply. Out of an annual output of around 750,000 tons, fully two-thirds is now taken for industrial purposes, particularly for the construction of motorways, and the remainder for agriculture. Extensively used as filling material in the restoration of quarries, iron ore pits, cut down woodland and land depressions, unique physical properties make it invaluable in the provision of good grazing land, particularly for out of season grazing. Favoured with a relatively high lime status, it is popular as a surface dressing on damp, acid coal measure uplands and dressings of up to 40 tons per acre are common.

There are instances where 'flyash', as it is known, has formed the sides of silos. Because of its tendency to consolidate and form a hard surface it is a cheap but effective material in the making of high camber roads over wet and otherwise intractable land. It has also formed the base material in the construction of parks, playing fields, bowling greens and lawns.

Sewage and sludge

In parts of the industrial uplands where the proportion of inbye to hill is low, grazing afforded by municipally owned sewage water meadows is a

valuable contribution to agricultural output. Let on an extended grazing licence, the land, which is periodically flooded with treated sewage water by a system of shallow reens, produces phenomenal crops of grass and, whilst the sward is conspicuous by the absence of clover, it is highly productive cattle pasture.

Solid sludge is a useful supplement to inorganic fertilizers on farms within reasonable distance of the sewer beds, but the presence of toxic material restricts dressings to intervals of five years.

Shoddy and phosphatic waste

Fellmonger shoddy is both valuable and popular in the market gardening world, particularly on the lighter soils; from large scale glue extraction the phosphatic waste material, the equivalent of superphosphate, has great agricultural value.

Railway sleepers, waste timber and iron

Agricultural use of waste timber and iron are legion and in areas where good fencing is the pre-requisite to livestock farming, railway sleepers have become an important, almost indispensable, item of agricultural equipment.

Sawdust and wood shavings

In a pastoral livestock rearing area, with straw in short supply and the collection of bracken confined to areas amenable to mechanization, sawdust and wood shavings are the main forms of bedding material with demand outstripping supply. Recent introductions are pine wood chips, flakes and pit prop peelings, which, having passed the usual critical period of transition, are now firmly established as suitable forms of bedding material.

Lime-soda sludge

An unusual development having an indirect bearing on agriculture is the proposal of one authority to extract water from colliery underground workings to supplement local water supplies. In the purification process, in addition to the end product, there is a waste material in the form of lime-soda sludge.

Disposal of this sludge into underground workings, nearby rivers, or to the creation of china-clay-like cones is no longer permitted; but on the acid coal measure uplands dressings of this material, provided it does not contain too much sodium, could well form the basis of a suitable mineral treatment in grassland improvement. Coinciding with the project to extract water is the proposal of an active Commoners' Association to improve an appreciable acreage of common land by surface treatment. With an improved lime status, the pre-requisite to grassland improvement, an amicable agreement as to the disposal of the sludge could be rewarding to industrial and agricultural interests alike.

Poultry and pig manure

Even if modern large scale pig and poultry enterprises remain within the orbit of agriculture the disposal of manure is fast attaining the status of an industrial operation.

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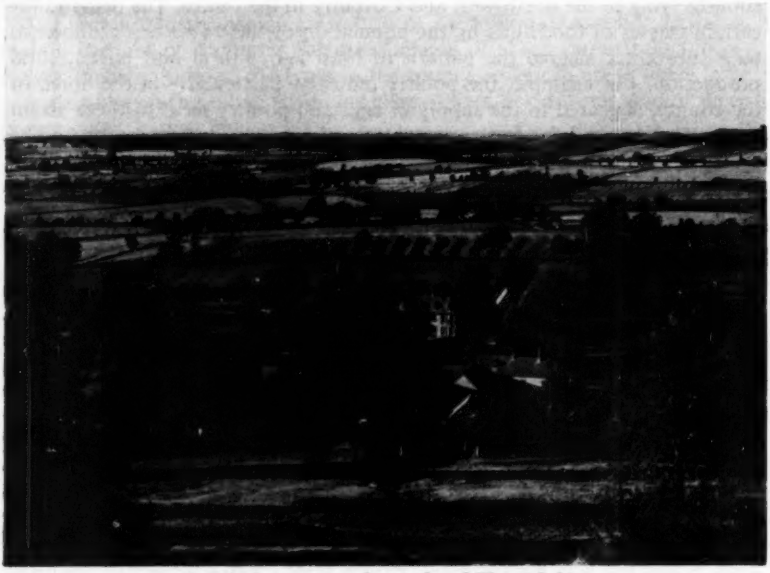

A typical panorama of agricultural Warwickshire

44. Warwickshire

A. T. Haesler

WARWICKSHIRE, situated in the heart of England, is an area of farming contrasts. It is a compact county extending for some 50 miles from north to south, and 30 miles from east to west. Its description 'leafy Warwickshire' is very apt; although the areas of woodland are relatively small and scattered, the hedgerows are heavily timbered. Topographically, Warwickshire is an undulating county ranging from 95 to 833 ft above sea level, but the area of land which is unploughable solely on account of contour is very small.

The type of farm is determined by rainfall, soil type, tradition, and by its proximity to the markets provided by the Midland conurbation. The annual average rainfall is 25 inches with some variation between different parts of the county, and of course between seasons. Soil types are variable, but in general the county consists of 34 per cent very heavy to heavy, 35 per cent heavy to medium, and 31 per cent medium to light; this is, of course, in terms of surface texture.

Urban influence

Situated as it is, the county is greatly influenced by Birmingham and its suburbs lying to the north-west and Coventry in the centre. The demand for certain classes of foodstuffs by the population of these two cities influences to a substantial degree the pattern of both agricultural and horticultural production. For example, the poultry industry, particularly in the north of the county, is geared to the supply of eggs and poultry meat to these urban areas. The demand for fresh vegetables and amenity nursery products like roses, flowers, etc. also has an important influence.

In addition, urban industries, particularly engineering and car manufacture, compete for labour with agriculture. This has the effect of raising agricultural wages and creating a scarcity of farm workers.

Arable crops

The farming area amounts to about 440,000 acres, 60 per cent of which is under arable cultivation and 40 per cent permanent pasture.

Until 1961 the main cereal crop was wheat, but this was then overtaken by barley which reached a peak acreage of 95,500 in 1967. The fluctuations in wheat acreage are invariably due to weather conditions in the autumn; when these are favourable the acreage rises, and vice versa. This is understandable when it is appreciated that most of the wheat is grown on the heavier soils in the south and south-east of the county. Yields are also dependent on climatic factors but given favourable conditions yields of 40 and even 50 cwt per acre are common. Arable crops, which consist in the main of cereals (170,000 acres), potatoes (7,000), beans (4,000), produce an estimated revenue of over £7 million at current prices.

Market gardens and nurseries

Horticulture, with a gross output of £1¾ million, is concentrated, so far as commercial food producing units are concerned, in the Avon Valley. The specialist holdings may be divided into glasshouse nurseries, market gardens, and fruit farms, and these vary in size from 200–300 acres in the case of a few fruit farms to less than an acre on some glasshouse nurseries. In recent years garden centres have been developed on individual nurseries to satisfy the demands of the urban dweller in and around the big cities. There has also been considerable developments of growing in containers to meet customer requirements for planting trees, shrubs, etc. at any time of the year.

Dairy products and livestock

The estimated output from livestock and livestock products in the county amounts to approximately £15½ million, of which the largest contribution is from milk (£5¼ million). Milk production was first established in the late 1800s to satisfy the demands of Birmingham and, to a lesser extent, Coventry. Subsequently, dairy herds were established all over the county and are now fairly evenly distributed. Under pressures of one sort or another the numbers of milk producers have steadily declined. In 1958 there were 1,800 producers in the county; by 1970 these fell to below 1,000. However, the average herd size increased from nineteen cows in 1958 to forty in 1970, whilst the yield of the main breed, the British Friesian, has increased by some 20 per cent

over the 20-year period to 1966. It is interesting to note that 52 per cent of the herds are housed and milked in cowsheds, half of them having less than thirty cows.

The sheep industry, yielding a return of £1 million, is steadily declining, mainly because of economic factors. Density of sheep population follows closely the variations of soil types in the county, except in areas where large conurbations make husbandry of any class of livestock difficult, and of sheep in particular, almost impossible.

The Royal

No reference to agricultural Warwickshire should omit a mention of the Royal Show, which has been established at its permanent site at Stoneleigh Abbey for a number of years. It first came to the county in 1859 when it yielded a profit of nearly £1,000. The National Agricultural Centre is increasingly making a name for itself as a forward-looking demonstration centre.

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The Ministry's Publications

Since the list published in the February 1971 issue of *Agriculture* (p. 86) the following publications have been issued.

MAJOR PUBLICATIONS

TECHNICAL BULLETINS

No. 18. Manual of Veterinary Parasitological Laboratory Techniques (New) (SBN 11 240918 0) 90p (postage extra)

No. 22. Stages of Bulb Development (New) 17½p (postage extra) (SBN 11 240992 9)

OUT OF SERIES

Experimental Husbandry Farms and Experimental Horticulture Stations 11th Progress Report (New) 75p (postage extra) (SBN 11 240962 8)

FREE ISSUES

ADVISORY LEAFLETS

No. 177. Wheat Bulb Fly (Revised).

No. 245 Apple and Pear Scab (Revised).

No. 349. Spring Cabbage (Revised).

SHORT TERM LEAFLETS

No. 83. Chemical Weed Control in Carrots, Parsnips, Parsley and Celery (Revised).

No. 111. Cage Floor Design (New).

No. 114. Soil Structure and Subsoiling (New).

No. 115. Financial Control Measures in Agriculture (New).

No. 116. Valuations for Management Accounting (New).

No. 118. Management of Ware Potato Stores (New) (Previously A.L. 488).

POSTER

Sheep Worrying (New).

Priced publications are obtainable from Government Bookshops (addresses on p. 140) or through any bookseller. Single copies of the free items are obtainable from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex. HA5 2DT.

Opencast Coal Mining and Conservation

R. J. Boulton, *A.D.A.S., Cardiff*

For many centuries the winning of coal has constituted part of the South Wales economy, but it was not until the mid-nineteenth century that the industry in that part of the country became pre-eminent. With its expansion and new techniques, several deep mines were sunk to win the rich seams of the different kinds of mineral, varying from coking coal in the east to steam and anthracite coals in the west. Deep mining left very many scars, some in the form of prominent mountains of waste which, in time, became grassed-over coal tips.

During the Second World War, when there was a great demand for coal, it was decided to supplement the existing methods of extraction by resorting to opencast mining and the first site in South Wales was worked in 1943. Most of the opencast operations are on the north and south rims of the coal field, the coal having been deposited as a kind of saucer with mountain on top; it is only where the saucer comes fairly near the surface that opencast coaling can take place.

Conditions of opencast working

The role of the Agricultural Land Service resulting from these operations is to supervise the steps eventually to be taken to restore the sites so that they can contribute to the needs of agriculture and forestry, and of course amenity considerations. Consequently the Service is involved during the entire operation and acts in a twofold capacity. It represents the Ministry and also acts as an agent to the National Coal Board. Initially, after consultation with the Regional Drainage Engineer, 'Working Conditions' are submitted to the Opencast Executive of the N.C.B. These prescribe, among other things, the depth of topsoil and subsoil to be removed and the diversion of watercourses during the working of a site, and are incorporated in the Board's application for Authorization.

Topsoil and subsoil are stripped and kept on one side, the overburden of shale, etc. being extracted and built into a mound until the coal seam is revealed. After taking the coal the overburden is replaced and levelled off to approved contours. Provided the subsoil and topsoil have been replaced satisfactorily, the Ministry, acting for the N.C.B. takes over the land to carry out the agricultural restoration, unless the land is to be restored to forestry, when the Forestry Commission carries out the required planting.

Land on coal measures

In South Wales the land overlying the coal measures is of inferior quality, being in many instances a rush-infested peat. It presents several unique difficulties in relation to restoration to agriculture not so often encountered elsewhere in Britain:

1. Inherent poor quality of the soil and lack of topsoil.
2. Boulder clay.
3. Erosion due to steep slopes.
4. Heavy rainfall.
5. Large quantities of stone.
6. Incidence of rush.

In addition, the terrain is likely to comprise old colliery tip areas with virtually no top or subsoil. However, where soil-forming material comes to light during the working of a site, it can be incorporated in the restored surface provided it is free from sodium. Shale is often the only available material but this weathers readily and such sites have been restored satisfactorily. After-management, however, is vital; without it land restored after opencast coaling operations is liable to revert rapidly.

Up to the present time some 8,644 acres have been restored in South Wales and almost 8,000 acres are in the hands of coaling contractors; approximately 4,000 acres are being restored, of which 2,500 acres are scheduled for agriculture and 1,500 acres for forestry.

Cottage Hall opencast site, Carmarthen, before entry by the National Coal Board

Seeding and other restoration measures

The large quantities of stone present a big problem and, as no satisfactory method of stone picking by machine has yet been devised, it has to be carried out by manual labour. In addition to seeding areas of land, other restoration works include erection of fences (oak posts and wire or concrete posts and wire), hedge banks (planted with quick-thorn and having protective fences), gates, ditch and tile drainage works. If it is proved that the natural supply of water has been lost piped main water supplies are also provided.

A pre-requisite to reseeding is the application of lime and fertilizers and subsequently top dressings of complete compound fertilizers. During the period of agricultural restoration grazing licences are issued for limited periods, the Ministry reserving the right to ask the grazier to move his stock if the land is being over-grazed or in the event of it being under-grazed, the right to top off surplus growth.

Countryside Award

It is worthy of note that in the Prince of Wales Countryside Award for Wales Competition for the best examples of conservation in the Principality during European Conservation Year 1970, the Opencast Executive of the N.C.B. was rated equal first with two other entrants, the Welsh Derelict Land Unit and the Monmouthshire Derelict Land Unit, for pioneer work in reclamation. The Board's entry related to agricultural restoration of the Cottage Hall Site in Carmarthenshire which, prior to opencast mining, consisted of a derelict tip, a disused railway, red ash waste and scrub. Now the area has been put back to more favourable contours and is sown with grass which is showing an established face. In due course the site will be parcelled into convenient enclosures with a piped mains water supply.

Cottage Hall opencast site and agricultural restoration at the present time

Typical improvements

Other typical examples of the contribution made to the improvement of the Welsh countryside by the restoration of opencast sites are:

Pentwyn Fochriw, Glamorgan

Removal of a colliery tip was achieved by disposing of the mound of spoil into the working 'cut' of the Pontlottyn opencast coal site. Now, instead of an ugly eyesore, the residents of the adjoining housing site have an uninterrupted view down the valley and are able to gaze on a pleasant sward.

Tirpentwys, Monmouth

This site of 1,100 acres at an elevation of 1,500 ft consisted largely of mountain grazings with a large colliery tip on the sky-line. By an arrangement between the Lord of the Manor and the commoners, the latter were given additional grazing elsewhere, and about 250 acres have been restored to forestry. Instead of a big coal tip on the sky-line a most desirable restoration has been achieved and already the trees planted by the Forestry Commission give a pleasing contrast with the restored grassland and in addition provide shelter for the stock on the common land.

Bryngwyn and Penwaun, Aberdare

A complete transformation and restoration to agriculture has been carried on at these two sites and on part of the Royal Arms Site near Dowlais Top. These areas, when viewed from the Heads of the Valleys road today, present a pleasing prospect in direct contrast to adjoining land which bears the scars of earlier industrial dereliction.

There can be little doubt that after opencast coal operations, the final restoration can achieve a definite improvement on the original appearance of sites and can provide greater grazing potential where the restoration is to agriculture. Indeed, it may truly be said that many areas of industrial waste have disappeared as a result of extracting coal by opencast methods.

Industrial Waste and Agriculture in Glamorgan—*continued from page 128.*

In Glamorgan the disposal of manure from certain large scale units is undertaken by organized manure disposal groups. In one particular case upwards of 100 tons of poultry manure are removed each week from an undertaking by each of a ten member group, on rota to their respective farms.

In another, manure from a broiler enterprise is removed by a group of three farmers; in others it is collected by mutual agreement between group members according to their respective needs or availability of transport.

A considerable quantity is used in the restoration of opencast coal land and derelict colliery tips with satisfactory results. In due course, it could figure prominently in the improvement of common grazings.

Towards a better future

It can fairly be said that planned reclamation of derelict land on a comprehensive basis could have nearly as much impact on the countryside in the next century as the creation of country parks and estates in the eighteenth century has had on this.

Indeed, the classical definition of waste—'A product for which the owner has no further use and where the reclamation or residual value is no longer desirable or viable'—is today considered somewhat unrealistic or antiquated.

Brynmor Rees, N.D.A., the author, is with A.D.A.S. in Glamorgan.

in brief

- **Food consciousness**
- **The new look**
- **Poultry records and true profit**

Food consciousness

IT may not often be recognized as such, but perhaps the most important piece of fixed equipment on the farm is the kitchen, from whence all human power flows. Whatever balanced feeding programmes are devised and administered outside, we have yet to hear of farmhouse rationing on the basis of maintenance plus performance. On the contrary, English farmhouse fare has long enjoyed a reputation for conferring human repletion, and its analysis in terms of nutritional components is allowed to take care of itself.

Nevertheless, at a time when we have never been more food conscious than we are today, the new edition of the Ministry's best seller, *Manual of Nutrition**, explains the principles of sensible eating in relation to physical work, provides a conducted tour of the digestive tract and describes the metamorphoses of cooking. Obviously, the daily need for energy and the amount and kind of food required to supply it will vary from bank clerk to blacksmith. A comparative table shows agricultural work (non-mechanized) on average to be equated with ballroom dancing and tennis at an energy need of 5–7·4 kilocalories per minute, whereas most domestic work, along with bricklaying and golf, needs only 2·5–4·9 kcal/min, and only those employed as furnace men in the steel industry, engaged on lumber work, or addicted to cross-country running and the crawl stroke at swimming can claim to be in the very heavy category needing over 10 kcal/min.

Stripped of its gastronomic gilding, the nourishment of man is seen to be resolved into no more than the chemical process of living, with carbohydrates, fats, proteins and vitamins combining to perform a delicate and extremely complex function and enzymes operating as the catalyst. Only when the diet sheet replaces free choice do we normally start measuring the energy potential of one food against another. But why wait to cost the imbalance? Some knowledge of the science of nutrition, such as this manual outlines, is of immediate importance in evaluating foods before they come to the table; this is so whether catering for the young whose appetites are sharpened by growth and a special need for protein and vitamins, the old whose needs though less may be specific, or the majority of adolescents and adults whose body requirements vary largely with occupation, leisure activity and personal metabolism. A daily energy requirement for the average man can be put at (kcal) 2,700 for sedentary workers, 3,000 for those moderately active, and 3,600 for the very active. For most women the total energy requirement is about 2,200 kcal. Seemingly, it is not enough to enjoy what we are eating. We also need to know what result we can expect from it—a salutary thought when making up the next animal feed ration!

The new look

THE techniques of infra-red aerial photography and remote sensing being developed in the United States promise to bring substantial benefits to world agriculture.

*Obtainable from H.M. Stationery Office, price 47½p (51p by post).

Dr. George Irving, writing in the current issue of the *O.E.C.D. Agricultural Review* defines remote sensing as 'the acquisition of information about an object of phenomenon which is not in intimate contact with the information-gathering device', of which the X-ray machine, radar and the Geiger counter are now commonplace examples. The new instrumentation emerging from man's pioneering of space and now being directed to agriculture and forestry already includes various camera systems, scanner-radiometers, passive microwave radiometers and side-looking radar operating from aircraft and satellite. These will provide information about the earth's surface more quickly, and often more accurately, than can be obtained by the pedestrian methods of ground observation. Not so long ago such ideas would have been dismissed as pure fantasy.

Thermal infra-red sensors, already used by the Forest Service of the U.S. Dept. of Agriculture in the mapping of fire-lines at any time of the day and even through dense smoke, and for differentiating between hardwood and conifer resources, may also in future be employed in soil surveys by revealing gross differences in soil texture and moisture. This would confer an immense saving in time and manpower over present conventional methods and, by more specific knowledge of soil conditions, enable fertilizers to be applied more economically. Likewise, variations in crop yields are shown up in film density differences and may, therefore, offer a basis for assessing yield estimates, which in turn could lead to improved marketing and distribution of food. Water resources, so often the limiting factor in the agriculture of developing countries, may more readily be detected for management gu' lance, and losses of crops may be circumvented by early warning and identification of pest and disease attack.

These and other benefits which will surely accrue to agriculture from aerial and space-based 'observers' have, by a stricter evaluation than has hitherto been possible, the potential of indicating a more efficient use of the world's land resources in terms of food production. Much interpretative work yet remains to be done by building up data banks of precise information on the radiation characteristics of vegetation, soil and water, but it is no exaggeration to say that we now stand upon the threshold of a re-examination of our environment in depth, poised for a new look.

Poultry records and true profit

IT is a reasonable assumption that every poultry farmer keeps records of some kind, but whether, individually, they are true or distorting mirrors of the unit's efficiency is another matter. Merely to set receipts against costs at the end of a flock's performance life is to lose time in stopping any profit leaks during that period. The feeding bill, for example, though a recognized important cost ingredient, may be returning a less per capita profit than anticipated if efficiency checks are not taken at frequent intervals. While egg production should be examined weekly, the margin of eggs over feed should be looked at every four weeks, and the gross margin at the end of the flock's life.

Rearing records for comparative purposes need to be kept over a period of twenty weeks, in which mortality among the birds is one of the principal factors in assessing the cost of the first quality point-of-lay pullet. Depreciation of house and equipment, both annually and per batch of pullets, and the precise cost of labour, regular and casual, are also factors which often tend to be estimated rather than exactly determined. The recording formulae specially designed to help poultry-keepers arrive at an assessment of true profit which are given in the Ministry's leaflet S.T.L. 56* simplify an indispensable piece of desk-work.

*Single copies obtainable, free, from Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

AGRIC.

Soils of the Leeds District. (Memoirs of the Soil Survey of Great Britain). A. CROMPTON and B. MATTHEWS. 1970.

With the publication of this Soil Map Sheet No. 70, 28 sheets for England and Wales are now available; it covers 216 square miles of the West Riding of Yorkshire to the north and east of Leeds. The first chapter gives a general description of the area and the second deals with soil formation, survey methods, soil groups, and mapping units. The soils in the three physiographic regions, into which the area surveyed falls, are described in the next three chapters and alluvial and peat soils in a following chapter. Much diversity is shown as regards land classification and capability including some of the best soils and one of the worst climates to be found in this country. Discussion of the analytical data for nearly 200 soils from both the pedological and agricultural points of view follows. Three further chapters deal with land use history, and the soils in relation to agriculture, horticulture and forestry.

Finally, a summary of the properties and management problems of the soils under cultivation and one soil after opencast mining is given, arranged in alphabetical order of soil series names for easy reference. Appendices give details of the methods and terms used in soil profile descriptions.

The value of this countrywide survey is being improved, albeit slowly, by the use of some soil series names first mapped in other areas, such as the Bridgnorth, Anglezarke and Dale Series, and discussion of related series found elsewhere, such as the Linby Series in Derbyshire and the warp soils in Devon.

Copies may be obtained from the Librarian, Rothamsted Experimental Station, Harpenden, Herts. Price £2.

H.T.D.

Collins Guide to Tree Planting and Cultivation. H. L. EDLIN. Collins, 1970. £2·10.

Mr. Edlin needs no introduction to those who are interested in trees. He is the author of many works on the subject and this is a worthy successor. Copiously illustrated, its avowed aim is 'to meet the needs of those who wish to plant trees for future enjoyment, or for the future needs of timber users'. The book is encyclopaedic in its content and no aspect of the subject appears to have escaped the notice of its author. The mechanics of planting and after-care are covered in great detail, together with an abundance of helpful illustrations. A novel chapter on 'Trees and the Law' provides useful information on the tree owner's privileges and obligations. Quite half the contents are devoted to a detailed consideration of the various kinds of trees available for planting in this country.

Essentially a practical work, there are also elementary notes on tree anatomy and physiology and a section on nomenclature and classification which should help those to whom Latin names present difficulties. One must, however, question the assertion that most specific names are meaningless. This is an astonishing statement and is certainly not in accord with the facts.

In spite of the excellence of the subject matter, the index is not beyond reproach and one presumes that its preparation was entrusted to someone other than the author.

A veritable storehouse of knowledge, this very outstanding book cannot fail to remain a standard work on the subject for many years to come.

F.B.

Place of Stones. RUTH JANETTE RUCK. Faber and Faber, 1970. 60p.

Most childhood dreams are fleeting. But not so those of Ruth Ruck, who steadfastly clung to the hope that one day she would have a farm of her own. Carneddi (the place of stones), eighty-three acres of steep, rocky land perched on a spur of the Welsh Highlands, was the fulfilment of that dream —and Ruth was just eighteen. This book is her personal record of fourteen years in which the determination and sheer hard work of the Ruck family conquered inexperience and the restrictions imposed by lack of capital to make this hill farm a

notable achievement. With assistance under the 1946 Hill Farming Act, the dilapidations of Carneddi were replaced by functional buildings and a larger, reconditioned farmhouse. New and more ambitious enterprises followed which were diversified between cows, sheep, poultry and strawberries; and though each inevitably brought its problems and anxieties, the answers were found and the pattern of successful hill farming began to emerge. On this score the author pays full tribute to the help and encouragement which she received from that ardent champion of the small farm, George Henderson, and the local N.A.A.S. and Veterinary Officers, to say nothing of the neighbourly helping hand.

Originally published in 1961, the publisher's decision to reissue this book in paperback form will give it a further lease that can be measured only in terms of interest and enjoyment. 'Chance brought us to Carneddi, inclination kept us there' says the author. But this is an understatement. Faith, the driving force of a dream and the spiritual harmony of mind and mountain were also there.

S.R.O'H.

Intensive Beef Production. T. R. PRESTON and M. B. WILLIS. Pergamon Press, 1970. £8.

This book is a fascinating mixture of textbook, review and prophetic writing. There are 167 tables and nearly 100 pages of references in its 522 pages. An international approach is taken throughout to the broad subject of intensive beef production and the scene is set by a chapter on World meat markets by G. Hagelberg of Berlin.

The authors define their subject as the growing and/or feeding of cattle under conditions of confinement in which all feed is carried to the animals. The book is divided into four main sections. The first reviews the general subject of carcase composition and quality and the specifics of intensively produced carcases.

In the following section, chapters on beef calf and dairy calf production are preceded by those on genetic improvement, genotype environment interactions and the physiology of digestion and feed utilization.

The section on production embraces the various factors affecting growth and efficiency, including a most interesting chapter on nutrition. Carbohydrate-rich crops other than cereals would appear to be growth points both in this country and abroad.

The final section, on the perspectives of the subject, is full of both controversy and sound thinking. Perhaps insufficient emphasis is given to the difficulties of effluent disposal in intensive systems and to the problems of investment in intensive enterprises in the under-developed countries.

This is an extremely valuable reference book which will appeal to readers with a wide range of interests within the subject. One criticism, however, would be that the photographic illustrations are often disappointing, both in what they portray and in their reproduction.

J.O.L.

Vitamins in Feeds for Livestock. F. C. AITKEN and R. G. HANKIN. Commonwealth Agricultural Bureaux, 1970. £3·25.

Despite the vast accumulation of data on the vitamin contents of the most common feeds used for farm livestock, there has not hitherto existed a comprehensive review of the present state of knowledge readily available to research workers, advisers and feed manufacturers. Indeed, over the years, the position has become more involved as research has revealed and clarified errors of determination, the complexities of vitamin equivalents of different precursors, problems of availability, and the complex inter-relationships of vitamins and other nutrient components of the dietary. The purpose of this book is to set forth the present state of knowledge of the subject and, with critical insight, to indicate the directions in which further research needs to be pursued. No doubt as clarification proceeds some of the data will require substantial revision.

The work has been presented skilfully in a very readable and accessible form that should serve as an authoritative source of reference until a new edition becomes necessary. It is particularly valuable in (a) indicating the most reliable information available on the subject, (b) delineating areas of doubtful knowledge that can only be filled as new research information unfolds and (c) providing an up-to-date assessment of knowledge on vitamin availability, precursors and dietary interrelationships.

The authors are to be congratulated on the skill with which they have carried out a most difficult assignment.

A.E.

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Errata

Chloroxuron (p. 66)—the entry 'Tenoran 50 WP-Duphar-Midox' should be deleted.

Stop Press (p. 159) for Chortoluron read **Chlortoluron**

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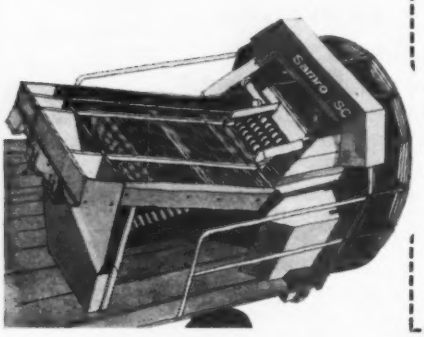

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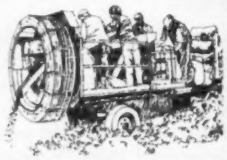

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